STOPPING WATER POLLUTION AT ITS SOURCE

MISA

Municipal/Industrial Strategy for Abatement

DEVELOPMENT DOCUMENT FOR THE EFFLUENT LIMITS REGULATION FOR THE MISA PULP AND PAPER SECTOR

Ontario

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THE DEVELOPMENT DOCUMENT FOR THE EFFLUENT LIMITS REGULATION FOR THE MISA PULP AND PAPER SECTOR

WATER RESOURCES BRANCH

ONTARIO MINISTRY OF THE ENVIRONMENT

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EXECUTIVE SUMMARY

The Municipal/Industrial Strategy for Abatement (MISA) program is Environment Ontario's program to reduce the discharge of toxic contaminants to Ontario's waterways. Under the first phase of MISA, dischargers were required to monitor and report on the contaminants present in their effluent streams. This information has subsequently been used to set legal discharge limits requiring reductions in toxic discharges to the level attainable with the best available pollution control technology which is economically achievable. The ultimate goal of the MISA program is the virtual elimination of persistent toxic contaminants from all discharges into Ontario's waterways.

This document contains all the legal effluent discharge requirements for Ontario's MISA Pulp and Paper Sector. These requirements are specified in "Ontario Regulation (?)/93: Effluent Limits - MISA Pulp and Paper Sector". The regulation is issued under the Ontario Environmental Protection Act (Section 136).

"Ontario Regulation (?)/93: Effluent Limits - MISA Pulp and Paper Sector" states the quality and quantity discharge limits, toxicity testing, flow measurement, and reporting requirements that each direct discharge pulp and paper mill must meet. The regulation comes into force on (?), 1996, allowing mills a period of three (3) years within which to implement pollution control strategies and install those capital works necessary to meet the effluent limits.

Ontario Regulation (?)/93 states that sampling points must be established within each pulp and paper mill on every process effluent stream and cooling water effluent stream. Routine monitoring requirements, designed to provide the Ministry of the Environment with assurance that the mills are meeting the regulation requirements, are tabulated in accompanying schedules.

This document is comprised of six chapters.

The first chapter of this document is introductory and presents the environmental background to MISA and the main features of the program. A description of the Effluent Monitoring Regulation for the Pulp and Paper Sector is given and the generic effluent limits regulation development process is explained.

Chapter two presents information about the MISA Pulp and Paper Sector. The sector consists of twenty-seven direct discharge pulp and paper mills, nine of which are kraft mills, eight are sulphite-mechanical mills, two are corrugating mills and the remaining eight are deinking-board-fine papers-tissue mills. Information about each mill is given, including age and location, production capacities, processes used and the composition and treatment of mill effluents.

Chapter three contains information about the effluent monitoring data used in the development of the effluent limits. The chapter includes a summary of the data collected under the voluntary pre-regulation effluent monitoring program and under the one year regulated MISA effluent monitoring program (the complete MISA effluent monitoring database is presented in Appendix II of this document). Data validation, candidate parameter selection and QA/QC data assessment are also discussed in this chapter.

The next chapter describes the assessment of available pollution control technologies for the control of mill effluent discharges and describes the identification of those technologies considered to be the "best available". Chapter four also examines the economic and financial implications of each of the "best available" technology (BAT) train options, and presents a summary of the likely impact of each BAT option on the sector as a whole.

Chapter five presents the effluent limits and describes the limit development process. Existing control requirements are also reviewed along with those from other jurisdictions.

The sixth chapter presents a summary of the key components of the Effluent Limits Regulation for the MISA Pulp and Paper Sector. Compliance requirements and monitoring frequencies are defined, as are other regulation requirements such as toxicity testing criteria and flow measurement accuracy.

This document represents the culmination of over six years of effort on the part of the Ministry, industry, and the public. The public review process was a key component in the development of the Effluent Limits Regulation for the Pulp and Paper Sector. The draft version of the regulation was released for public review in (?), 1992, and the Ministry received (?) comments from across the province. In addition to the public review, the regulation was reviewed by the MISA Advisory Committee, which is a committee made up of environmental experts external to the Ministry who provide advice directly to the Minister on the contents of the MISA regulations.

THE MISA INITIATIVE

CHAPTER 1

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1.1 THE MISA PROGRAM

The MISA program was officially announced by the Ontario Ministry of the Environment in the White Paper of June 1986[1]. MISA is a regulatory program for reducing water pollution from both industrial and municipal dischargers. Initially, technology-based effluent limits will be imposed on each discharger as a minimum pollution control requirement. In addition, more stringent effluent limits can be imposed on dischargers on a site-specific basis to protect local sensitive receiving waterbodies. The ultimate goal of MISA is the virtual elimination of persistent toxic contaminants from all discharges into Ontario's waterways.

The process to develop technology-based effluent limits involves two phases. In the first phase, effluent monitoring regulations are legislated which require dischargers to monitor their point source effluents at regular intervals according to specific sampling, analytical, flow measurement and quality assurance and quality control protocols and procedures. The second phase involves the development and implementation of effluent limits regulations for each of the industrial and municipal sectors, using the data collected under the monitoring regulations.

The MISA effluent monitoring and limits regulations will initially involve all major polluters, on a sector-by-sector basis, that discharge directly into Ontario's waterways, including:

- Industrial Dischargers in the following major sectors:
  - Petroleum Refining
  - Organic Chemical Manufacturing
  - Iron and Steel
  - Mining
  - **Pulp and Paper**
  - Inorganic Chemical Manufacturing
  - Metal Casting
  - Electric Power Generation
  - Industrial Minerals

(This group accounts for approximately two-thirds of Ontario's direct industrial dischargers; the remaining dischargers will be covered as other sectors are brought under regulation.)

- Municipal Sewage Treatment Works

The Municipal Sector consists of all sewage treatment plants in the province. Dischargers to municipal sewers constitute the indirect discharger group, which will be regulated under the MISA Sewer Use Control Program.

The Effluent Monitoring Regulations required dischargers to monitor their point source discharges at regular intervals. This monitoring was intended to provide comprehensive data on effluent quality, particularly for toxic contaminants. In order to accurately reflect all discharger operating conditions, the effluent monitoring regulations required sampling at various frequencies over an entire year using specified standard procedures. Industry's self-monitoring under the regulations was subject to independent audits carried out by the Ministry of the Environment.

Information generated by the effluent monitoring regulations produced a database on the contaminants discharged across Ontario. This database is being evaluated and used in the development of effluent limits based on the best available pollution control technology which is economically achievable (BATEA).

The Effluent Limits Regulations are being developed in consultation with different levels of government, industry and the general public. Consultation is facilitated through Joint Technical Committees (JTCs), made up of representatives from the Ministry, Environment Canada, and the affected dischargers. These committees, one per sector, provide an opportunity for the dischargers to have input into the regulation development process.

Review of the regulations is initially provided by the MISA Advisory Committee (MAC) which is an independent committee of technical and environmental experts that provides the Minister of the Environment with advice and comments on the development and implementation of the MISA program. All regulations appear in draft form for a period of (?) days to allow for public review and comment, prior to promulgation.

Development of the Effluent Limits Regulations does not end with the promulgation of the last sector regulation. The Ministry is committed to keeping abreast of available pollution reduction technology. To that end, the Effluent Limits Regulations will be reviewed and, if technology emerges which allows the imposition of more stringent effluent limits on a particular sector, then the regulation will be amended to reflect those limits.

Through this process of ongoing evaluation and step-by-step reductions, MISA's ultimate goal to virtually eliminate the discharge of toxic contaminants will be achieved. Such a goal fulfils Ontario's commitment to the protection and improvement of our natural water resources, and is consistent with the provisions of the Canada-Ontario Agreement Respecting Great Lakes Water Quality[2] and the Canada-United States Great Lakes Water Quality Agreement[3].

1.2 THE EFFLUENT MONITORING REGULATIONS

The MISA Monitoring Strategy

A large number and variety of chemicals are manufactured and used in today's industrial society. During the development of the Effluent Monitoring Regulations, the Ministry realized that a system was required to evaluate the chemicals to be monitored by each industrial sector. The Ministry also realized that it would be necessary to limit the number of allowable monitoring techniques in order to provide a common scientific basis for comparison of data from sector-to-sector and from site-to-site.

The Ministry developed a monitoring strategy based on:

- the Effluent Monitoring Priority Pollutants List (EMPPL) which identifies toxic contaminants of concern
- voluntary pre-regulation effluent monitoring which facilitated the identification of the specific chemicals to be monitored, their monitoring frequency and the appropriate techniques for chemical analysis.

The Effluent Monitoring Priority Pollutant List

The Effluent Monitoring Priority Pollutant List (EMPPL) is a dynamic list containing the names of those contaminants potentially present in industrial and municipal discharges which could pose a hazard to the receiving environment. In order to initiate and maintain such a list, the Ministry developed a "hazard assessment" process, which evaluated, for a particular contaminant:

- Potential presence in effluents discharged to Ontario's waterways
- Environmental persistence
- Potential to bioaccumulate
- Acute and sub-lethal toxicity to biological organisms, including humans, as measured by specific indicators of toxicity such as the ability to induce tumours and affect successive generations.

Initial efforts, which are fully documented[4], resulted in EMPPL containing 183 chemicals or groups of chemicals. The hazard assessment process is ongoing. The current EMPPL (1988) contains 266 chemicals or groups of chemicals.

Chemicals not on the current EMPPL but identified through open scan characterization will be candidates for assessment and, possibly, inclusion on EMPPL. Chemicals may also be added to reflect new environmental fate or toxicity information. Although initiated as part of the initial MISA monitoring strategy, EMPPL will be used on an ongoing basis for the development of MISA Effluent Limits Regulations.

Pre-Regulation Effluent Monitoring

Pre-regulation effluent monitoring was undertaken voluntarily by the industrial dischargers in each sector to provide an initial database on which to build the sector-specific requirements for the Effluent Monitoring Regulations. Pre-regulation effluent monitoring included:

- the collection of information covering several areas of plant operations from process descriptions, raw material use, to sewer diagrams and effluent treatment information

- site visits by multi-disciplinary teams to inspect on-site operations, general environmental control practices and sampling and flow monitoring locations

- effluent monitoring studies using sampling and analytical protocols provided by the Ministry

- technical reviews of other databases such as:

    - MOE open characterizations
    - Historical monitoring data
    - MISA Pilot Site Program studies
    - Environment Canada studies
    - Company-supplied monitoring and chemical use data
    - Published literature on process effluent contaminants from similar sources

- Development of sector-specific monitoring lists based on EMPPL and pre-regulation effluent monitoring data.

Upon completion of the pre-regulation effluent monitoring, the Ministry developed sector-specific effluent monitoring regulation requirements.

Principles of the Effluent Monitoring Regulations

In designing the Effluent Monitoring Regulations, every effort was made to ensure that the information gathered under the regulations would provide an accurate characterization of effluent quality. The monitoring program was, therefore, designed to ensure the following conditions were met:

- The monitoring data would be of known and acceptable quality. The requirements specified in the MISA effluent monitoring regulations were designed to ensure acceptable data quality. A system of procedures and documentation was prescribed for all monitoring activities including sampling techniques, sample preservation, analytical procedures, flow measurement and data reporting. In addition, the regulations prescribed the minimum amounts of QA/QC data that were to be generated and the terms and conditions under which such data were to be reported to the Ministry.

- The monitoring data would reflect effluent variability. Dischargers were required to monitor during all operating conditions, including normal and upset conditions, in all seasons of the year.
- The monitoring data would be of sufficient volume to provide a statistically valid database for the development of effluent limits.

Effluent Streams Monitored

The MISA Effluent Monitoring Regulations required direct dischargers to monitor all point source discharges of pollution entering surface watercourses, including process effluent, cooling water effluent, storm water effluent, backwash effluent, emergency overflow effluent and waste disposal site effluent.

Monitoring Frequencies

The Ministry's approach to monitoring reflected both the need for a comprehensive data base, and the limitations imposed by practical considerations, including cost. Frequent monitoring (daily, thrice weekly and weekly) was required for a short list of parameters while less frequent monitoring (monthly, quarterly, semi-annually and annually) was required for a longer list of parameters.

Sampling Requirements

To ensure that data of proven quality would be obtained from the samples collected during monitoring, sample collection and preservation needed to be rigorously controlled.

Whenever possible, sampling of process effluents was required prior to dilution. Sample collection methods included automatic sampling, flow-proportional sampling, and grab sampling.

Sample preservation protocols were specified for all the parameters that were susceptible to degradation through chemical, biological or physical interaction. These protocols ranged from the addition of a chemical preservative to simple refrigeration and storage criteria.

Flow Measurement

For process effluent streams, the effluent monitoring regulations specified that flow measurement readings were to be taken continuously and accurately. For cooling water, backwash, storm water, emergency overflow and waste disposal site effluent streams, flow measurement readings were measured or estimated at the time of sampling.

To ensure that these flow measurement readings were precise and representative, the regulation specified the frequency and defined the acceptable limits of accuracy for flow measurement on each type of stream.

Analytical Requirements

Analytical principles were provided for the analysis of all samples. Adherence to these principles was required in order to ensure that the data generated would be reliable, of consistent quality, and sufficiently compatible to be integrated into a valid and meaningful database.

Under the effluent monitoring regulations, laboratories were required to provide the analytical method detection limit (MDL) for each parameter before the samples could be analyzed. The MDL is the minimum concentration of a parameter necessary to imply its presence in a sample with a level of confidence greater than 99 per cent. The procedures for determining analytical method detection limits are provided in the Ministry publication titled "Estimation of Analytical Method Detection Limits (MDL)"[5].

Toxicity Testing

Toxicity testing was used to assess the potential impact of complex effluents on the aquatic environment. Two types of toxicity tests were required under the Effluent Monitoring Regulations for each sector:

- **Rainbow Trout Acute Toxicity Test.** This test is the standard fish lethality test in Ontario; an effluent is considered acutely lethal if 50% or more of the rainbow trout die when kept in undiluted effluent for a period of 96 hours.

- **Daphnia magna Acute Lethality Test.** For this test, an effluent is considered acutely lethal if 50% or more of the Daphnia magna die when kept in undiluted effluent for a period of 48 hours.

Reporting

The Effluent Monitoring Regulations required direct dischargers to report to the Ministry all of the effluent monitoring data collected under the regulations. The reporting section of each sectoral regulation specified report type, content, timing, and format.

Ministry Audit

Audits were conducted by the Ministry to confirm that self-monitoring data reported by direct dischargers was representative of the quality and quantity of effluent discharged to the environment.

Enforcement

Failure to comply with the requirements of the Effluent Monitoring Regulations was considered to be a violation of the Environmental Protection Act.

The General Effluent Monitoring Regulation

Under MISA, the monitoring requirements for each industrial sector were outlined in a general effluent monitoring regulation and a sector-specific regulation. The general effluent monitoring regulation, Ontario Regulation 695/88 as amended to Ontario Regulation 533/89[6], expressed the technical and scientific principles of monitoring that were common to all sectors. The sector-specific regulation stated how the monitoring principles should be applied to plants in the specific sector.

The general effluent monitoring regulation described sampling and analytical requirements, flow measurement requirements, and toxicity testing and reporting procedures.

The sector-specific effluent monitoring regulations listed the effluent streams and parameters to be monitored at each plant, and their monitoring frequencies. Also listed were the plant specific and sector specific requirements for characterization analysis, routine chemical monitoring, toxicity testing, flow measurement and reporting.

The Effluent Monitoring Regulation for the MISA Pulp and Paper Sector

The Effluent Monitoring Regulation for the Pulp and Paper Sector was designed to provide an accurate report on the discharge of priority and traditional pollutants by the twenty-seven direct discharge mills in Ontario.

The regulation was developed by the Ministry in consultation with representatives from the Ontario Pulp and Paper Industry, MISA Advisory Committee and Environment Canada through the MISA Pulp and Paper Sector Joint Technical Committee.

The specific requirements of the Effluent Monitoring Regulation for the Pulp and Paper Sector are presented in Ontario Regulation 435/89 as amended to Ontario Regulation 202/90[7]. A detailed explanation of the rationale behind the specific requirements is presented in the Development Document for the Effluent Limits Regulation for the MISA Pulp and Paper Sector[8].

1.3 THE EFFLUENT LIMITS REGULATION DEVELOPMENT PROCESS

Effluent Limits Regulations are being imposed on each of the nine industrial sectors and the municipal sector. The Effluent Limits Regulation for the Pulp and Paper Sector will regulate the twenty-seven direct discharge mills in Ontario.

The Effluent Limits Regulations are being developed by the sectoral Joint Technical Committees with input from the MISA Advisory Committee.

The process which was followed in developing the Effluent Limits Regulation for the Pulp and Paper Sector was initially outlined in the MISA White Paper. Each step is briefly described as follows:

Step 1: Effluent Monitoring

Under the Effluent Monitoring Regulation, direct dischargers were required to monitor for a comprehensive list of contaminants. Up to 135 parameters were monitored on a daily, thrice weekly, weekly, monthly, bi-monthly and semi-annual basis for process effluent, cooling water effluent, storm water effluent, emergency overflow effluent, backwash effluent and waste disposal site effluent.

Step 2: Data Validation

The effluent monitoring data were subject to a rigorous data validation exercise in order to confirm the integrity of the information contained in the effluent monitoring database.

Step 3: Candidate Parameter Selection

Statistical tests were applied to the effluent monitoring data to determine candidate parameters for effluent limits setting. Parameters were not considered if the effluent monitoring data showed (at a 95% confidence level) that a statistical portion of 0.9 of the data were at a concentration of less than the regulation method detection limit.

Step 4: QA/QC Data Assessment

The quality assurance/quality control (QA/QC) data assessment evaluated the suitability of the effluent monitoring data for use in the effluent limits setting process. Data which were considered unreliable were eliminated from further consideration in the effluent limit setting process.

Step 5: Available Technology Identification

Available pollution control technologies were identified and evaluated. The technologies were screened on the basis of the number, kind, and toxicity of the contaminants treated, and the contaminant reductions achieved.

Step 6: BAT Identification

Best available technologies were identified and BAT technology train options, representing different levels of pollution control and abatement, were determined. BAT technology train options were reviewed in order to identify the contaminants that would be treated if the options were retrofit at Ontario mills, the costs of retrofitting each option and the contaminant discharge levels that would result.

Step 7: Economic Assessment

Information about estimated pollutant removal efficiencies and the costs of the various BAT technology train options was used to derive abatement cost functions which indicate the relationship between increasingly stringent levels of control and the cost of achieving them. The financial and economic consequences to the pulp and paper sector in Ontario associated with the various levels of control were also estimated.

Step 8: BAT(EA) Identification

The information on the identified BAT technology train options and the economic and financial impacts of each option on the sector were used to determine the "best available technology economically achievable", BAT(EA), upon which the effluent limits are based.

Step 9: Effluent Limits Setting

Effluent limits were developed based on the identified BAT(EA) and the best professional judgement of the Ministry and Industry as to the contaminants levels that can be achieved by pulp and paper mills in Ontario.

The Effluent Limits Regulation

In addition to the effluent limits developed using the above process, the effluent limits regulation contains requirements for toxicity testing. Toxicity testing requirements stipulate when and how dischargers must test their effluents.

Flow measurement requirements are also included in the limits regulation. Pollutant load reductions are determined by multiplying the concentration of the contaminants in the effluent by the rate at which the effluent is discharged. The accuracy of this measurement depends, in part, on the accuracy of the device which is used to measure the flow. Therefore, a level of accuracy and precision for flow measuring devices was set, and dischargers must ensure that their equipment is designed and maintained to achieve it.

The effluent limits regulation stipulates that direct dischargers must comply with the requirements of the regulation. The regulation sets out the terms and conditions of compliance. These terms specify what the dischargers must do in order to demonstrate that the regulation requirements are being met.

The frequency of contaminant monitoring for the purpose of assessing compliance with the effluent limits is a main component of the regulation compliance requirements. Information gained through compliance monitoring will provide the Ministry and the public with information on the effectiveness of the MISA program.

The Ministry is committed to reporting to the public, information on which dischargers are in compliance, which dischargers have to implement further pollution abatement, and the status of individual abatement programs. Reports will also indicate progress toward achieving the MISA goal of virtual elimination of persistent toxic substances.

The effluent limits regulations will be periodically reviewed and, if new technology emerges which could reduce contaminant levels below those imposed by the current limits, then the regulations will be revised to reflect the more stringent limits.

(Notes)

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THE INDUSTRIAL SECTOR

CHAPTER 2

OF THE

DEVELOPMENT DOCUMENT

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2.1 INDUSTRY PROFILE

There are twenty-seven pulp and paper mills located in the Province of Ontario that discharge effluent directly to surface watercourses. Sixteen mills are located in Northern Ontario, five in Eastern Ontario and the remaining six in South-Central Ontario. Figure 2.1 identifies the location of the twenty-seven mills and the receiving waters that the mills discharge to.

In 1990, Ontario pulp and paper mills produced about five million tonnes of saleable pulp and paper products while employing nearly 16,000 people in the province. In terms of employment, the pulp and paper industry is the fifth leading manufacturing industry in Ontario behind motor vehicle parts, motor vehicles, primary steel and electronic equipment. When resource jobs (woodlands, harvesting and management) are included the pulp and paper industry directly employs approximately 75,000 people in Ontario[1]. Table 2.1 lists the twenty-seven mills, the products produced and the approximate number of employees at each mill.

2.2 PRODUCTION PROCESSES

Pulp is an intermediate product used in the manufacture of paper and paper products and is manufactured in Ontario by a number of different processes which generate wastewater effluents with varying characteristics. Traditionally, pulping processes have been divided into chemical pulping processes and mechanical pulping processes.

In chemical pulping processes, wood fibres are separated by breaking down the bonds between the fibres with chemical reactants, generally at temperatures of about 150 to 200 degrees celsius. Up to 60% of the mass of the wood can be converted into soluble organics by the process so that the yield of pulp can be as low as 40%[2]. The two main chemical pulping processes used in Ontario are the sulphate (kraft) process and the sulphite process.

FIGURE 2.1: LOCATION OF DIRECT DISCHARGE PULP AND PAPER MILLS IN ONTARIO

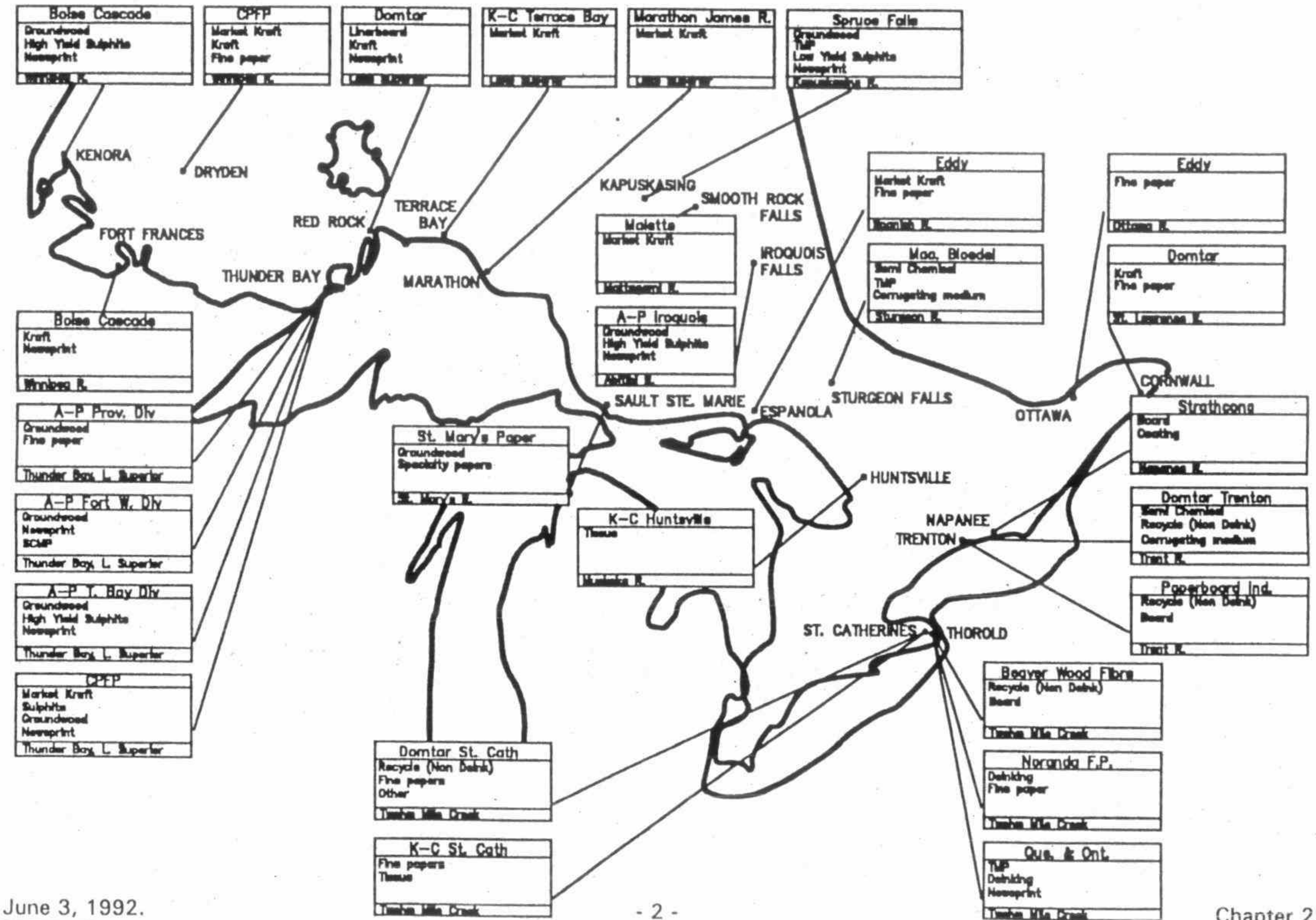

Table 2.1
The MISA Pulp and Paper Sector
Final Products and Employment (1990)

Company	Product	Integrated Mill	Production tonnes/year	Employees
Abitibi-Price (Fort William)	Newsprint	Yes	142,350	300
Abitibi-Price (Iroquois Falls)	Newsprint	Yes	321,200	900
Abitibi-Price (Provincial Papers)	Fine Papers	Yes	182,500	250
Abitibi-Price (Thunder Bay)	Newsprint	Yes	167,900	325
Beaver Wood (Thorold)	Paperboard	No	107,310	160
Boise Cascade (Fort Frances)	Market Pulp/ Groundwood specialty	Yes	73,000 282,875	1,000
Boise Cascade (Kenora)	Newsprint	Yes	346,750	850
CPFP (Dryden)	Market Pulp/ Fine Papers	Yes	146,000 219,000	1,030
CPFP (Thunder Bay)	Market Pulp/ Newsprint	Yes	482,895 447,490	2,033
Domtar (Cornwall)	Fine Papers	Yes	301,125	1,450
Domtar (Red Rock)	Linerboard Newsprint	Yes	237,250 91,250	650
Domtar (St. Catharines)	Fine Papers	No	73,000	300
Domtar (Trenton)	Corrugating Medium	Yes	123,370	140
E.B. Eddy (Espanola)	Market Pulp/ Fine Papers	Yes	269,370 62,780	600
E.B. Eddy (Ottawa)	Fine Papers	No	62,050	600
James River-Marathon	Market Pulp	No	182,500	380
Kimberly-Clark (Huntsville)	Tissue	No	33,580	250
Kimberly-Clark (St. Catharines)	Tissue/ Fine Papers	No	21,900 21,900	200

Table 2.1 (cont'd)
The MISA Pulp and Paper Sector
Final Products and Employment (1990)

Company	Product	Integrated	Production tonnes/year	Employees
Kimberly-Clark (Terrace Bay)	Market Pulp	No	438,000	730
MacMillan-Bloedel (Sturgeon Falls)	Corrugating Medium\ Hardboard	Yes	129,575	420
Malette (Smooth Rock Falls)	Market Pulp	No	117,165	300
Noranda (Thorold)	Fine Papers	No	116,800	625
Quebec & Ontario (Thorold)	Newsprint	Yes	317,915	1,150
St. Marys Paper (Sault Ste. Marie)	Groundwood Specialties	Yes	200,750	520
Spruce Falls (Kapuskasing)	Newsprint	Yes	365,000	1,200
Strathcona (Napanee)	Boxboard	No	123,370	160
Trent Valley, Paperboard	Paperboard	No	118,625	279
Total			6,326,545	16,802

In mechanical pulping processes, wood fibres are separated by the application of mechanical energy under wet conditions. The fibres are literally torn apart, one from the other. In true mechanical pulping only about 5% of the weight of the original wood is lost as dissolved organics and a few percent rejected in solid form so that product yields are typically 90 to 96%. The most popular mechanical pulping processes used in Ontario are stone groundwood (SGW) pulping and thermomechanical pulping (TMP).

In the last twenty-five years, a number of hybrid chemical/mechanical processes have been developed making the simple distinction between chemical pulping processes and mechanical pulping processes somewhat obsolete. At most mills, traditional low-yield sulphite pulping operations have been replaced with hybrid processes like chemimechanical pulping (CMP), chemi-thermomechanical pulping (CTMP), high-yield sulphite pulping (HYS) and ultra high-yield sulphite pulping (UHYS).

For the sake of simplicity only the main pulping processes used in Ontario are discussed below.

The Sulphate (Kraft) Process

The sulphate (kraft) process, is the dominant chemical pulping process used in Ontario and in the rest of the world because of the high strength pulp that it produces. Kraft pulp is produced by cooking wood chips at elevated pressure and temperature in a digester with a strong alkali solution. The alkali solution, generally referred to as white liquor, is typically 10% sodium sulphide and sodium hydroxide.

Spent cooking liquors (known as black liquor) are separated from the kraft pulp by washers following cooking in the digester and are treated in a chemical recovery system. The recovery system regenerates the cooking chemicals of sodium sulphide and sodium hydroxide while utilizing the heat value of the organic residue to generate steam for the process[3].

Kraft pulp is usually bleached by molecular chlorine, chlorine compounds and related chemicals and then dried for sale or used on site for papermaking.

There are nine mills in Ontario that make kraft pulp with a combined annual kraft pulp production capacity of 6,938 tonnes.

The Sulphite Process

In the sulphite pulping process, wood fibres are separated by the action of sulphur dioxide and a metallic base under pressure and at elevated temperature. Initially calcium was used as the sulphite liquor base because of an inexpensive and ample supply of limestone (calcium carbonate).

In recent years, the use of calcium as a base material has declined because the spent cooking liquor is both difficult and expensive to recover or burn. If spent cooking liquor is not recovered or burned then it must be discharged as an effluent thereby significantly increasing effluent treatment costs. Calcium use is also declining because of the diminishing availability of softwood feedstocks which are the most suitable for calcium-based pulping. Most sulphite mills now use a soluble chemical base like magnesium, ammonia or sodium which permits spent liquor recovery or incineration[4].

Sulphite pulps are used to produce many types of paper including tissue and writing papers. In combination with other pulps, sulphite pulps have even more applications. There are five mills in Ontario that make sulphite pulp with a combined annual sulphite pulp production capacity of 930 tonnes.

The Stone Groundwood Process

The stone groundwood (SGW) process was the earliest form of mechanical pulping used commercially and is the most extensively used mechanical pulping process in Ontario. Logs are forced into contact with a revolving grindstone in the presence of water to reduce the wood to a macerated fibrous condition. The applied water cools, cleans, and lubricates the stone and conveys the pulp away from the stone.

Groundwood pulp is used mainly in the manufacture of newsprint. There are ten mills in Ontario that make groundwood pulp with a combined annual groundwood pulp production capacity of 4,053 tonnes.

The Thermomechanical Process

Thermomechanical pulp (TMP) is produced by passing wood chips through a disk refiner which consists of two serrated plates, one or two of which are rotating. TMP refiners generally operate under pressure at temperatures over 100 degrees celsius. The process requires twice as much power as the stone groundwood process but produces a wood pulp with better mechanical properties.

Thermomechanical pulp, like stoneground wood pulp, is used mainly in the manufacture of newsprint. There are four mills in Ontario that make thermomechanical pulp with a combined annual thermomechanical pulp production capacity of 1,307 tonnes.

2.3 INDUSTRY CATEGORIES

In Ontario, there are six integrated kraft mills, three market kraft mills, ten integrated mechanical pulp mills and eight paper mills that discharge effluent directly to surface watercourses. An integrated mill is a mill that has both a pulp mill and paper mill on site and a market mill is a mill that sells pulp to customers outside the producing company.

Under the Effluent Monitoring Regulation for the MISA Pulp and Paper Sector, the twenty-seven mills were divided into four categories: sulphate (kraft), sulphite-mechanical, corrugating and deinking/board/fine papers/tissue. Mills were placed into a particular category depending on the manufacturing processes used at the mill. Tables 2.2 to 2.5 list the four categories and the mills that were assigned to each category.

The Sulphate (Kraft) Category

The nine mills in the sulphate (kraft) category are briefly described below in terms of mill size, products produced, number of employees, effluent treatment systems in place and wastewaters generated.

Boise Cascade Canada Ltd. (Fort Frances)

The mill was originally constructed in 1914 as a groundwood pulp mill. A kraft pulp mill was added in 1971 and the mill now makes 575 tonnes/day of groundwood pulp and 570 tonnes/day of kraft pulp. The mill uses the pulp to manufacture 775 tonnes/day of groundwood specialty paper and sells 200 tonnes/day of kraft pulp to various customers. The mill has 1,000 employees.

The MISA Pulp and Paper Sector

Table 2.2
The Sulphate (Kraft) Category

Mill Name	Location
Boise Cascade Canada Ltd.	Fort Frances
Canadian Pacific Forest Products Ltd.	Dryden
Canadian Pacific Forest Products Ltd.	Thunder Bay
Domtar Inc., Fine Papers Division	Cornwall
Domtar Inc., Containerboard Division	Red Rock
E.B. Eddy Forest Products Ltd.	Espanola
James River-Marathon Ltd.	Marathon
Kimberly-Clark Canada Inc.	Terrace Bay
Malette Kraft Pulp and Power Co.	Smooth Rock Falls

Table 2.3
The Sulphite-Mechanical Category

Mill Name	Location
Abitibi-Price Inc., Fort William Division	Thunder Bay
Abitibi-Price Inc., Iroquois Falls Division	Iroquois Falls
Abitibi-Price Inc., Provincial Papers Division	Thunder Bay
Abitibi-Price Inc., Thunder Bay Division	Thunder Bay
Boise Cascade Canada Ltd.	Kenora
Quebec & Ontario Paper Company Ltd.	Thorold
St. Marys Paper Inc.	Sault Ste. Marie
Spruce Falls Power and Paper Company Ltd.	Kapuskasing

The MISA Pulp and Paper Sector (cont'd)

Table 2.4
The Corrugating Category

Mill Name	Location
Domtar Inc., Containerboard Division	Trenton
MacMillan-Bloedel Ltd.	Sturgeon Falls

Table 2.5
The Deinking/Board/Fine Papers/Tissue Category

Mill Name	Location
Beaver Wood Fibre Company Ltd.	Thorold
Domtar Inc., Fine Papers Division	St. Catharines
E.B. Eddy Forest Products Ltd.	Ottawa
Kimberly-Clark Canada Inc.	Huntsville
Kimberly-Clark Canada Inc.	St. Catharines
Noranda Forest Inc., Recycled Papers	Thorold
Strathcona Paper Company	Napanee
Trent Valley, Paperboard Industries Corporation	Trenton

Effluent treatment consists of a wet woodroom clarifier, two kraft mill settling basins, a paper mill clarifier and secondary effluent treatment consisting of an aerated basin. In-plant control measures include a closed screen room. Mill effluent discharges via a submerged diffuser to the Rainy River.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 9,430 kg/day of BOD, 10,987 kg/day of TSS and 1,964 kg/day of AOX. Effluent flow was 80,710 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in 10 of the 12 monthly samples that were collected and acutely lethal to Daphnia magna in 2 of the 8 monthly samples that were collected.

Canadian Pacific Forest Products Ltd. (Dryden)

The mill was constructed in 1913 as a kraft pulp and sheathing mill. Great Lakes Forest Products Ltd. purchased the mill from the Dryden Timber and Power Company in 1979. The mill has 1,030 employees and presently makes 830 tonnes/day of bleached kraft pulp which is used to manufacture 600 tonnes/day of fine paper. The mill sells 400 tonnes/day of kraft pulp to various customers.

Effluent treatment consists of a primary clarifier and secondary effluent treatment consisting of an aerated basin with jet aeration. In-plant control measures include spill recovery and a catch-all spill diversion system. Mill effluent discharges underwater to the Wabigoon River which eventually flows into the Winnipeg River.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 2,761 kg/day of BOD, 5,011 kg/day of TSS and 1,936 kg/day of AOX. Effluent flow was 89,192 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in 5 of the 14 monthly samples that were collected and non-lethal to *Daphnia magna* in the 11 monthly samples that were collected.

Canadian Pacific Forest Products Ltd. (Thunder Bay)

The mill was originally constructed in 1924 as a groundwood mill. In 1927, a newsprint mill was constructed and in 1936 a sulphite mill was added. A kraft mill was constructed in 1966 and was followed by a second kraft mill in 1976. The mill has 2,033 employees and makes 1,450 tonnes/day of bleached kraft pulp, 570 tonnes/day of groundwood pulp, and 520 tonnes/day of thermomechanical pulp which are used to manufacture 1,226 tonnes/day of newsprint. The mill sells 1,323 tonnes/day of kraft pulp to various customers.

Effluent treatment consists of four primary clarifiers with a new secondary effluent treatment system consisting of oxygen enhanced activated sludge treatment. In-plant control measures include dry debarking, a steam stripper for kraft condensate, a closed screen room, high chlorine dioxide substitution and soap and turpentine recovery. Mill effluent discharges underwater to the Kaministiquia River which eventually flows into Lake Superior.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 48,622 kg/day of BOD, 15,335 kg/day of TSS and 4,171 kg/day of AOX. Effluent flow was 176,069 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in the 12 monthly samples that were collected and acutely lethal to Daphnia magna in 9 of the 12 monthly samples that were collected.

It should be noted that with the installation of the new secondary effluent treatment system, the quality of the effluent discharged from this mill will be much better than the quality of effluent discharged during the 1990 MISA monitoring period.

Domtar Inc., Fine Papers Division (Cornwall)

The mill was originally constructed in 1883 as a groundwood mill and in 1888, a sulphite pulping operation was added. A soda pulp mill was built in 1927 but was converted to a kraft mill in the 1940s. The sulphite and groundwood pulping operations were shut down in the 1970s and only the kraft mill remains. The mill has 1,450 employees and makes 450 tonnes/day of bleached kraft pulp which is used to manufacture 825 tonnes/day of fine paper.

Effluent treatment consists of a primary clarifier only. There is no secondary effluent treatment. In-plant control measures include a steam stripper, fibre spill recovery system, lime spill clarifier and filter. Mill effluent discharges via a submerged diffuser to the St. Lawrence River.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 20,867 kg/day of BOD, 9,750 kg/day of TSS and 431 kg/day of AOX. Effluent flow was 129,073 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in 3 of the 7 monthly samples that were collected and to Daphnia magna in 2 of the 12 monthly samples that were collected.

Domtar Inc., Containerboard Division (Red Rock)

The mill was constructed in 1945 as a sulphite mill. In 1959, the sulphite pulping operation was converted to a kraft mill and in 1970 the mill was expanded and renovated. The mill has 650 employees and makes 700 tonnes/day of unbleached kraft pulp, 50 tonnes/day of bleached kraft pulp, 200 tonnes/day of groundwood pulp, and 725 tonnes/day of other pulp (including waste). The mill uses the pulp to manufacture 250 tonnes/day of newsprint and 650 tonnes/day of linerboard.

Effluent treatment consists of a primary clarifier only. There is no secondary effluent treatment. In-plant control measures include alum addition to the primary clarifier to reduce toxicity, a steam stripper for kraft condensates and black liquor spill recovery. Mill effluent discharges via a surface outfall to Nipigon Bay which eventually flows into Lake Superior.

The 1990 MISA effluent monitoring data results indicate that the mill discharged on average 15,326 kg/day of BOD, 6,026 kg/day of TSS and 175 kg/day of AOX. Effluent flow was 97,050 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in the 7 monthly samples that were collected and acutely lethal to Daphnia magna in 3 of the 12 monthly samples that were collected.

E.B. Eddy Forest Products Ltd. (Espanola)

The mill began operations in 1902 as a groundwood mill. In 1936, the mill was closed and did not reopen until 1946 when a new kraft mill was constructed by the Kalamazoo Vegetable Parchment Company. In 1969, E.B. Eddy purchased the mill. Extensive modernization was undertaken from 1975 to 1983 including the installation of oxygen delignification and secondary effluent treatment. The mill has 600 employees and makes 910 tonnes/day of bleached kraft pulp. The mill uses the pulp to manufacture 172 tonnes/day of specialty paper and sells 738 tonnes/day of kraft pulp to various customers.

Effluent treatment consists of a two paper mill clarifiers, a woodroom settling lagoon and secondary effluent treatment consisting of an aerated lagoon. In-plant control measures include oxygen delignification, modified continuous cooking of softwood, and steam stripping for kraft condensates. Mill effluent discharges via a submerged diffuser to the Spanish River which eventually flows into the north channel of Lake Huron.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 1,808 kg/day of BOD, 2,592 kg/day of TSS and 854 kg/day of AOX. Effluent flow was 101,641 m^3/day. 1990 MISA toxicity test results indicate that the effluent was non-acutely lethal to rainbow trout in the 7 monthly samples that were collected and non-acutely lethal to Daphnia magna in the 12 monthly samples that were collected.

James River-Marathon Ltd. (Marathon)

The mill was constructed in 1945 as a kraft mill. In the late 1970s, the mill was modernized and in 1984 a foam retention lagoon was installed. The mill has 380 employees and makes 433 tonnes/day of bleached kraft pulp which is used to manufacture 500 tonnes/day of market kraft pulp.

Effluent treatment consists of a primary clarifier and foam retention lagoon. There is no secondary effluent treatment. In-plant control measures include high chlorine dioxide substitution, new brown stock washers and a spill collection system. Mill effluent discharges via a multiport diffuser to Lake Superior.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 11,991 kg/day of BOD, 2,654 kg/day of TSS and 2,787 kg/day of AOX. Effluent flow was 60,430 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in the 12 monthly samples that were collected and acutely lethal to Daphnia magna in the 12 monthly samples that were collected.

Kimberly-Clark Canada Inc. (Terrace Bay)

The mill was constructed in 1948 as a 320 tonne/day kraft mill. In 1978, a second kraft mill was constructed, however, a fire in 1981 resulted in the reconstruction of the mill, including several new process changes. The mill has 730 employees and makes 1,200 tonnes/day of bleached kraft pulp which is sold to various customers.

Effluent treatment consists of 2 primary clarifiers with secondary effluent treatment consisting of an aerated stabilization basin. In-plant control measures include liquor and fibre spill recovery systems and steam stripping for kraft condensates. Mill effluent discharges to Blackbird Creek which eventually flows into Lake Superior.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 1,452 kg/day of BOD, 3,866 kg/day of TSS and 1,967 kg/day of AOX. Effluent flow was 91,695 m^3/day. 1990 MISA toxicity test results indicate that the effluent was non-acutely lethal to rainbow trout in the 12 monthly samples that were collected and non-acutely lethal to Daphnia magna in the 12 monthly samples that were collected.

Malette Kraft Pulp and Power Company (Smooth Rock Falls)

The mill was constructed in 1916 as a sulphite mill and was converted into a kraft mill in 1965. The mill has 300 employees and makes 340 tonnes/day of bleached kraft pulp. The mill sells 321 tonnes/day of kraft pulp to various customers.

Effluent treatment consists of a primary clarifier. There is no secondary effluent treatment. Mill effluent discharges to the Mattagami River which eventually flows into James Bay.

The 1990 MISA effluent monitoring data results indicate that the mill discharged on average 8,011 kg/day of BOD, 1,750 kg/day of TSS and 1,208 kg/day of AOX. Effluent flow was 51,374 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in 10 of the 12 monthly samples that were collected and acutely lethal to Daphnia magna in the 12 monthly samples that were collected.

The Sulphite-Mechanical Category

The eight mills in the sulphite-mechanical category are briefly described below in terms of mill size, products produced, number of employees, effluent treatment systems in place and wastewaters generated.

Abitibi-Price Inc., Fort William Division (Thunder Bay)

The mill was constructed in 1922 as a groundwood pulp mill. A sulphite mill was later constructed and was replaced in 1981 with chemimechanical pulping. The mill has 300 employees and makes 220 tonnes/day of groundwood pulp and 130 tonnes/day of ultra-high yield sulphite pulp. The mill uses the pulp to manufacture 390 tonnes/day of newsprint.

Effluent treatment consists of primary clarifiers and settling ponds. There is no secondary effluent treatment. Mill effluents (2 outfalls) discharge via a semi-impounded bay to Lake Superior.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 13,277 kg/day of BOD and 1,227 kg/day of TSS. Effluent flow was 27,078 m^3/day. 1990 MISA toxicity test results indicate that the effluent for Control Point 0100 was acutely lethal to rainbow trout in the 11 monthly samples that were collected and acutely lethal to <u>Daphnia</u> <u>magna</u> in the 11 monthly samples that were collected. The effluent for Control Point 0200 was acutely lethal to rainbow trout in the 11 monthly samples that were collected and acutely lethal to <u>Daphnia</u> <u>magna</u> in the 11 monthly samples that were collected.

Abitibi-Price Inc., Iroquois Falls Division (Iroquois Falls)

The mill was constructed in 1914-15 and is the largest Abitibi-Price newsprint mill in Ontario. The mill operates a high yield sulphite pulping process (without recovery) and produces groundwood pulp. The mill has 900 employees and makes 540 tonnes/day of groundwood pulp and 272 tonnes/day of high yield sulphite pulp. The mill uses the pulp to manufacture 880 tonnes/day of newsprint.

Effluent treatment consists of 2 primary clarifiers. There is no secondary effluent treatment. Mill effluent discharges through a diffuser into the Abitibi River at Iroquois Falls.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 50,054 kg/day of BOD and 7,766 kg/day of TSS. Effluent flow was 64,946 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in the 11 monthly samples that were collected and acutely lethal to Daphnia magna in the 11 monthly samples that were collected.

Abitibi-Price Inc., Provincial Papers Division (Thunder Bay)

The mill was originally constructed in 1919 as a sulphite mill. In 1922, the mill began paper production and later groundwood pulp production. The sulphite pulping process was shut down in 1978. The mill currently has 250 employees and makes 100 tonnes/day of groundwood pulp which is used along with purchased market kraft pulp to manufacture 500 tonnes/day of fine paper.

Effluent treatment consists of a woodroom clarifier and a serpentine settling basin. There is no secondary effluent treatment. Mill effluent discharges directly via a surface outfall to Lake Superior.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 4,265 kg/day of BOD and 1,599 kg/day of TSS. Effluent flow was 47,679 m^3/day. 1990 MISA toxicity test results indicate that the effluent was non-acutely lethal to rainbow trout in the 6 monthly samples that were collected and non-acutely lethal to Daphnia magna in the 11 monthly samples that were collected. One Ministry inspection sample was lethal to Daphnia magna.

Abitibi-Price Inc., Thunder Bay Division (Thunder Bay)

The mill was constructed in 1926 as a sulphite and groundwood pulp mill. The mill has 325 employees and makes 340 tonnes/day of groundwood pulp and 140 tonnes/day of high yield sulphite pulp which are used to manufacture 460 tonnes/day of newsprint.

Effluent treatment consists of a woodroom clarifier and 2 settling basins. There is no secondary effluent treatment. Mill effluent discharges to a surface creek which runs into Lake Superior.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 28,280 kg/day of BOD and 1,869 kg/day of TSS. Effluent flow was 46,739 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in the 12 monthly samples that were collected and acutely lethal to Daphnia magna in the 12 monthly samples that were collected.

Boise Cascade Canada Ltd. (Kenora)

The mill was constructed in 1924 as a sulphite and groundwood pulp mill. The mill has 850 employees and makes 563 tonnes/day of groundwood pulp and 260 tonnes/day of high yield sulphite pulp. The mill uses the pulp along with purchased kraft pulp to produce 950 tonnes/day of newsprint.

Effluent treatment consists of a primary clarifier. There is no secondary effluent treatment. Mill effluent discharges through a diffuser to the Winnipeg River.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 33,132 kg/day of BOD and 3,376 kg/day of TSS. Effluent flow was 51,255 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely to rainbow trout in the 12 monthly samples that were collected and acutely lethal to Daphnia magna in the 11 monthly samples that were collected.

Quebec & Ontario Paper Company Ltd. (Thorold)

The mill began operation in 1913 and produced newsprint from sulphite and groundwood pulps. In the 1980s the mill constructed a deinking plant for recycling newsprint and in 1987 the sulphite operation was shut down. The mill has 1,150 employees and makes 352 tonnes/day of thermomechanical pulp and 432 tonnes/day of pulp from the deinking plant which are used to produce 871 tonnes/day of newsprint.

Effluent treatment consists of a primary clarifier with secondary effluent treatment consisting of oxygen activated sludge treatment. Mill effluent discharges via a submerged outfall to the Twelve Mile Creek.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 1,385 kg/day of BOD and 3,049 kg/day of TSS. Effluent flow was 61,546 m^3/day. 1990 MISA toxicity test results indicate that the effluent was non-acutely lethal to rainbow trout in the 5 monthly samples that were collected and non-acutely lethal to Daphnia magna in the 8 monthly samples that were collected.

St. Marys Paper Inc. (Sault Ste. Marie)

The mill was constructed in 1900 as a sulphite and groundwood mill. The sulphite pulp operations were shut down in the 1980s and replaced with purchased bleached kraft pulp. The mill has 520 employees and makes 450 tonnes/day of groundwood pulp which is used along with purchased kraft pulp to manufacture 550 tonnes/day of groundwood specialty papers.

Effluent treatment consists of a primary clarifier. There is no secondary effluent treatment. Mill effluent discharges to the St. Mary's River.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 6,849 kg/day of BOD and 5,814 kg/day of TSS. Effluent flow was 34,731 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in the 12 monthly samples that were collected and acutely lethal to Daphnia magna in the 12 monthly samples that were collected.

Spruce Falls Power and Paper Company Ltd. (Kapuskasing)

The mill was constructed in 1922 to produce groundwood pulp and calcium-based pulp. In 1964, a magnesium-based sulphite pulping operation (Magnafite) was built (including chemical recovery) and in 1976, a 200 tonne/day thermomechanical pulp mill was built. In 1982, the calcium sulphite operations were shut down and in 1983, thermomechanical pulp production was expanded to 300 tonne/day. The mill has 1,200 employees and now makes 500 tonnes/day of groundwood pulp, 320 tonnes/day of thermomechanical pulp and 128 tonnes/day of low yield sulphite pulp. The mill uses the pulp to produce 1,000 tonnes/day of newsprint.

Effluent treatment consists of primary clarifiers. There is no secondary effluent treatment. Mill effluent discharges to the Kapuskasing River.

The 1990 MISA effluent monitoring data results indicate that the mill discharged on average 35,622 kg/day of BOD and 7,260 kg/day of TSS. Effluent flow was 83,944 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in 12 monthly samples that were collected and acutely lethal to Daphnia magna in 12 monthly samples that were collected.

The Corrugating Category

The two mills in the corrugating category are briefly described below in terms of mill size, products produced, number of employees, effluent treatment systems in place and wastewaters generated.

Domtar Inc., Containerboard Division (Trenton)

The mill was constructed in 1926 as a soda pulp mill. In 1951, the soda pulp operation was replaced with NSSC pulping and in the 1970s, the NSSC process was converted to sodium carbonate semi-chemical pulping. The mill also processes recycled waste corrugating medium and board. The mill has 140 employees and makes 200 tonnes/day of semi-chemical pulp and 156 tonnes/day of other pulp (including waste) which is used to manufacture 338 tonnes/day of corrugating medium.

Effluent treatment consists of the recovery and reuse of spent pulping liquors as road dust suppressant. There is no secondary effluent treatment. In-plant control measures include an extensive white water recycle system. Mill effluent discharges via a submerged outfall to the Trent River which eventually flows into Lake Ontario.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 5,130 kg/day of BOD and 623 kg/day of TSS. Effluent flow was 4,028 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in the 12 monthly samples that were collected and acutely lethal to Daphnia magna in 9 of the 12 monthly samples that were collected.

MacMillan-Bloedel Ltd. (Sturgeon Falls)

The mill was constructed in 1898 and produced market groundwood pulp until 1930 when it was shut down. In 1948, the mill was reopened and produced hardboard (Masonite) and corrugating medium using the neutral semi-chemical pulping process. The mill has 420 employees and makes 240 tonnes/day of semi-chemical pulp and 115 tonnes/day of mechanical pulp which are used to manufacture 355 tonnes/day of hardboard and corrugating medium.

Effluent treatment consists of a flotation clarifier and secondary effluent treatment consisting of an anaerobic treatment system. Mill effluents (2 outfalls) discharge through a diffuser to the Sturgeon River which eventually flows into Lake Nipissing.

The 1990 MISA effluent monitoring data results indicate that the mill discharged on average 32,012 kg/day of BOD and 2,624 kg/day of TSS. The total effluent flow was 12,843 m^3/day. Ministry inspection toxicity test results indicate that the effluents were lethal to both rainbow trout and Daphnia magna in the first six months of MISA inspection monitoring.

The Deinking/Board/Fine Papers/Tissue Category

The eight mills in the deinking/board/fine papers/ tissue category are briefly described below in terms of mill size, products produced, number of employees, effluent treatment systems in place and wastewaters generated.

Beaver Wood Fibre Company Ltd. (Thorold)

The mill was constructed in 1913 and produced a variety of board and paper products. Prior to 1976, the mill produced groundwood pulp and purchased market pulp and waste paper products to manufacture newsprint and board. The mill has 160 employees and now uses purchased recycled waste paper and board to produce 294 tonnes/day of paperboard.

Effluent treatment consists of a clarifier and spill pond. There is no secondary effluent treatment. Mill effluent discharges via a surface outfall to Beaverdam Creek which eventually flows into Lake Ontario.

The 1990 MISA effluent monitoring data results indicate that the mill discharged on average 1,920 kg/day of BOD and 688 kg/day of TSS. Effluent flow was 15,114 m^3/day. 1990 MISA toxicity test results indicate that the effluent was non-acutely lethal to rainbow trout in the 12 monthly samples that were collected and acutely lethal to Daphnia magna in 5 of the 12 monthly samples that were collected.

Domtar Inc., Fine Papers Division (St. Catharines)

The mill was acquired in 1904 and was converted from a cotton mill to a paper mill in 1911. The mill now has 300 employees and manufactures 200 tonnes/day of fine paper from purchased pulps and recycled clean waste paper.

Effluent treatment consists of a primary clarifier. There is no secondary effluent treatment. In-plant control measures include saveалls which are used to recover pulp fibres and filler material from process water. Mill effluent discharges to Twelve Mill Creek which eventually flows into Lake Ontario.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 1,025 kg/day of BOD and 379 kg/day of TSS. Effluent flow was 10,186 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in 1 of the 7 monthly samples that were collected and acutely lethal to Daphnia magna in 3 of the 12 monthly samples that were collected.

E.B. Eddy Forest Products Ltd. (Ottawa)

The mill was constructed in 1905 and produced a variety of board and paper products. The paperboard mill was shut down in 1979. The mill has 600 employees and currently manufactures 170 tonnes/day of fine paper using pulp from the E.B. Eddy mill in Hull, Quebec which lies across the Ottawa River.

Effluent treatment consists of a primary clarifier. There is no secondary effluent treatment. Mill effluent discharges via a submerged outfall to the Ottawa River which eventually flows into the St. Lawrence River.

The 1990 MISA effluent monitoring data results indicate that the mill discharged on average 1,148 kg/day of BOD and 450 kg/day of TSS. Effluent flow was 7,401 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in 6 of the 12 monthly samples that were collected and acutely lethal to Daphnia magna in 10 of the 12 monthly samples that were collected.

Kimberly-Clark Canada Inc. (Huntsville)

The mill was constructed in 1971 and uses purchased bleached pulp to manufacture 92 tonnes/day of tissue products. The mill has 250 employees and is the largest tissue mill in Canada.

Effluent treatment consists of a primary clarifier, polishing basin and three percolating bed filters. Mill effluent discharges during winter months via an underwater outfall to the Big East River.

The 1990 MISA effluent monitoring results indicate that the mill discharged on average 3 kg/day of BOD and 4 kg/day of TSS. Effluent flow was 793 m^3/day. 1990 MISA toxicity test results indicate that the effluent was non-acutely lethal to rainbow trout in the 5 monthly samples that were collected and non-acutely lethal to Daphnia magna in the 6 monthly samples that were collected.

Kimberly-Clark Canada Inc. (St. Catharines)

The mill was constructed in 1912 as a groundwood mill. The mill has 200 employees and now uses purchased pulps to make 60 tonnes/day of tissue, 40 tonnes/day of crepe paper and 20 tonnes/day of fine paper products.

Effluent treatment consists of a primary clarifier and two settling ponds. There is no secondary effluent treatment. Mill effluent discharges via a surface outfall to Twelve Mile Creek which eventually flows into Lake Ontario.

The 1990 MISA effluent monitoring data results indicate that the mill discharged on average 319 kg/day of BOD and 66 kg/day of TSS. Effluent flow was 8,755 m^3/day. 1990 MISA toxicity test results indicate that the effluent was non-acutely lethal to rainbow trout in the 8 monthly samples that were collected and non-acutely lethal to Daphnia magna in the 12 monthly samples that were collected.

Noranda Forest Inc., Recycled Papers (Thorold)

The mill was constructed in 1903. The mill has 625 employees and manufactures 320 tonnes/day of fine paper from 115 tonnes/day of deinked recycled waste paper and purchased pulps.

Effluent treatment consists of a primary clarifier and secondary effluent treatment consisting of activated sludge treatment for the deink washing filtrate. Mill effluent discharges via an underground outfall to Twelve Mile Creek which eventually flows into Lake Ontario.

The 1990 MISA effluent monitoring data results indicate that the mill discharged on average 3,463 kg/day of BOD, 1,569 kg/day of TSS and 115 kg/day of AOX. Effluent flow was 22,128 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in the 12 monthly samples that were collected and acutely lethal to Daphnia magna in 11 of the 12 monthly samples that were collected.

Strathcona Paper Company (Napanee)

The mill was originally constructed in 1872. The mill has 160 employees and uses clean recycled waste paper and board to manufacture 170 tonnes/day of boxboard.

Effluent treatment consists of a flotation clarifier, settling basins and secondary effluent treatment consisting of aerated basins. Mill effluent discharges via a submerged outfall to the Napanee River which eventually flows into Lake Ontario.

The 1990 MISA effluent monitoring data results indicate that the mill discharged on average 386 kg/day of BOD and 214 kg/day of TSS. Effluent flow was 3,321 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in 4 of the 11 monthly samples that were collected and acutely lethal to Daphnia magna in 2 of the 12 monthly samples that were collected.

Trent Valley, Paperboard Industries Corporation (Trenton)

The mill is made up of two separate mills, the east and west mills. The east mill was originally constructed in 1880 to manufacture paperboard from straw and rags. It now uses recycled wastepaper and board. The west mill was built in 1976 and incorporates modern-day recycling and screening technologies into its manufacturing operations. The mill has 279 employees and produces 325 tonnes/day of packaging material.

Effluent treatment consists of two flotation clarifiers. There is no secondary effluent treatment. Mill effluent discharges via a submerged outfall to the Trent River which eventually flows into Lake Ontario.

The 1990 MISA effluent monitoring data results indicate that the mill discharged on average 1,509 kg/day of BOD and 524 kg/day of TSS. Effluent flow was 3,744 m^3/day. 1990 MISA toxicity test results indicate that the effluent was acutely lethal to rainbow trout in 5 of the 12 monthly samples that were collected and acutely lethal to Daphnia magna in 4 of the 12 monthly samples that were collected.

The Pulp and Paper Sector

The 1990 MISA effluent monitoring data results indicate that the twenty-seven direct discharge mills in the pulp and paper sector discharged on average 340,047 kg/day of BOD, 97,072 kg/day of TSS and 15,608 kg/day of AOX. Total process effluent flow was 1,383,465 m^3/day. 1990 MISA toxicity test results indicate that mill effluent was acutely lethal to rainbow trout in 180 of the 278 process effluent samples that were collected and acutely lethal to Daphnia magna in 164 of the 304 process effluent samples that were collected.

2.4 WATER USE AND WASTEWATER TREATMENT

Water Use

The extent of in-plant measures for the reduction of effluent discharge at source varies widely from mill to mill. Effluent discharges for the sector range from under 1,000 m^3/day to over 178,000 m^3/day. Table 2.6 lists the average production-based flowrates for each mill in the sulphate (kraft) category. Average production-based flowrates range from 77 m^3/tonne for Canadian Pacific Forest Products (Thunder Bay) to 178 m^3/tonne for Domtar (Cornwall). The average production-based flowrate the sulphate (kraft) category is 117 m^3/tonne.

Table 2.6
Average Production-based Flowrates for the Sulphate (Kraft) Category

Plant Name	Average Production-based Flowrate (m^3/tonne)
Boise Cascade Canada Ltd.(Fort Frances)	83
Canadian Pacific Forest Products (Dryden)	92
Canadian Pacific Forest Products (Thunder Bay)	77
Domtar Inc., Containerboard Division (Red Rock)	118
Domtar Inc., Fine Papers Division (Cornwall)	178
E.B. Eddy Forest Products Ltd. (Espanola)	108
James River-Marathon Ltd.	142
Kimberly-Clark Canada Inc. (Terrace Bay)	83
Malette Kraft Pulp and Power Company	172
Average for the Category	117

Table 2.7 lists the average production-based flowrates for each mill in the sulphite-mechanical category. Average production-based flowrates range from 55 m^3/tonne for Boise Cascade (Kenora) to 112 m^3/tonne for Abitibi-Price (Provincial Papers Division). The average production-based flowrate the sulphite-mechanical category is 81 m^3/tonne.

Table 2.7
Average Production-based Flowrates for the Sulphite-Mechanical Category

Plant Name	Average Production-based Flowrate (m^3/tonne)
Abitibi-Price Inc., Fort William Division	73
Abitibi-Price Inc., Iroquois Falls Division	81
Abitibi-Price Inc., Provincial Papers Division	112
Abitibi-Price Inc., Thunder Bay Division	99
Boise Cascade Canada Ltd. (Kenora)	55
Quebec & Ontario Paper Company Ltd.	73
St. Marys Paper Inc.	69
Spruce Falls Power and Paper Company Ltd.	85
Average for the Category	81

Table 2.8 lists the average production-based flowrates for each mill in the corrugating category. Average production-based flowrates range from 12 m^3/tonne for Domtar (Trenton) to 47 m^3/tonne for MacMillan-Bloedel Ltd. The average production-based flowrate the corrugating category is 30 m^3/tonne.

Table 2.8
Average Production-based Flowrates for the Corrugating Category

Plant Name	Average Production-based Flowrate (m^3/tonne)
Domtar Inc., Containerboard Division (Trenton)	12
MacMillan-Bloedel Ltd.	47
Average for the Category	30

Table 2.9 lists the average production-based flowrates for each mill in the deinking/board/fine papers/tissue category. Average production-based flowrates range from 8 m^3/tonne for Kimberly-Clark (Huntsville) to 82 m^3/tonne for Noranda Forest Recycled Papers. The average production-based flowrate the deinking/board/fine papers/tissue category is 47 m^3/tonne.

Table 2.9
Average Production-based Flowrates for the Deinking/Board/Fine Papers/Tissue Category

Plant Name	Average Production-based Flowrate (m^3/tonne)
Beaver Wood Fibre Company Ltd.	67
Domtar Inc., Fine Papers Division (St. Catharines)	63
E.B. Eddy Forest Products Ltd. (Ottawa)	45
Kimberly-Clark Canada Inc. (Huntsville)	8
Kimberly-Clark Canada Inc. (St. Catharines)	81
Noranda Forest Inc., Recycled Papers	82
Strathcona Paper Company	19
Trent Valley, Paperboard Industries Corporation	12
Average for the Category	47

Wastewater Treatment

The degree of effluent treatment varies widely from mill to mill. While all of the mills have primary effluent treatment, only nine of the mills have biological effluent treatment systems. Biological treatment systems are designed to create suitable conditions for the development and maintenance of microorganisms which convert organic pollutants in the effluent stream to more desirable or harmless forms. Table 2.10 lists the mills in Ontario that have biological effluent treatment systems and the type of system.

Activated sludge treatment (AST) is based on creating a settleable sludge of microorganisms which are grown on the soluble materials in the effluent. The sludge is recycled within the treatment system and excess sludge is concentrated and then incinerated or landfilled.

Table 2.10
Mills with Secondary Effluent Treatment

Mill	Treatment Type
Boise Cascade (Fort Frances)	Aerated stabilization basin
Canadian Pacific Forest Products Ltd. (Dryden)	Aerated stabilization basin with jet aeration
Canadian Pacific Forest Products Ltd. (Thunder Bay)	Oxygen enhanced activated sludge treatment
E.B. Eddy Forest Products Ltd. (Espanola)	Aerated stabilization basin
Kimberly-Clark Canada Inc. (Terrace Bay)	Aerated stabilization basin
MacMillan-Bloedel Ltd. (Sturgeon Falls)	Anaerobic treatment
Noranda Forest Inc., Recycled Papers (Thorold)	Activated sludge treatment
Quebec & Ontario Paper Company Ltd. (Thorold)	Oxygen enhanced activated sludge treatment
Strathcona Paper Company (Napanee)	Aerated stabilization basins

Activated sludge treatment (AST) can remove more BOD and TSS than aerated stabilization basin treatment but generates significant quantities of waste sludge and discharges higher quantities of nutrients. AST effluent is generally non-acutely lethal to rainbow trout and Daphnia magna.

Aerated stabilization basin (ASB) treatment is based on the long-term growth of microorganisms on the soluble materials in the effluent without the sludge recycle that is characteristic of the activated sludge process. When the microorganisms die, the sludge is used as a substrate for other microorganisms and thus the organic material causing BOD is digested.

The successful operation of an ASB system involves the control of the non-digestible sludge so that low TSS and BOD discharges are achieved in the final effluent without the dredging of sludge being necessary. The lowest attainable concentrations of BOD and TSS in ASB effluent are about double those for AST effluent. ASB effluent is generally non-acutely lethal to rainbow trout and Daphnia magna.

Anaerobic treatment is not as common as AST and ASB treatment. Anaerobic treatment processes operate in closed vessels without the addition of oxygen. Biomass forms as in the aerobic systems but the reaction is characterized by much slower growth and very little generation of waste sludge. A significant portion of the organic wastes is converted to methane, which is used as a fuel gas in some cases. Anaerobic treatment effluent is generally acutely lethal to rainbow trout and Daphnia magna and requires further aerobic polishing to render the effluent non-acutely lethal.

(Notes)

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THE EFFLUENT MONITORING DATABASE

CHAPTER 3

OF THE

DEVELOPMENT DOCUMENT

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3.1 EFFLUENT MONITORING

Traditionally, BOD, TSS and acute lethality have been the principle parameters used to evaluate the quality of pulp and paper mill effluent discharges. However, these parameters only provide a basis for examining the short term local effects of the discharges. In order to examine long-term effects and to set adequate effluent control limits, it is necessary to establish whether persistent, bioaccumulative substances are present in the effluent.

Pre-Regulation Effluent Monitoring

In 1987, the Ontario pulp and paper industry conducted a comprehensive study on the composition of pulp and paper mill effluents being discharged directly to Ontario surface waters[1]. The study, conducted under the auspices of the Ontario Forest Industries Association (OFIA), was designed to generate data for the development of the Effluent Monitoring Regulation for the MISA Pulp and Paper Sector.

Intake water and final effluent samples were collected from the twenty-seven direct discharge mills in Ontario and the samples were analyzed for a broad range of priority and conventional pollutants. Fish toxicity tests were conducted on all effluent samples and in total, one hundred and forty-four specific chemical and biological parameters were examined. In addition, open GC/MS "forensic scans" were also conducted in order to fully characterize mill effluent.

Industry collected and analyzed four rounds of effluent samples from each mill and conducted two GC/MS open characterization analyses. In order to verify the data collected by industry, the Ministry collected and analyzed one audit sample from each mill and conducted one GC/MS open characterization analysis. As the ministry's Effluent Monitoring Priority Pollutant List (EMPPL) was not yet fully developed, the samples were analyzed for the parameters on the US EPA Priority Pollutants list.

Sample collection and analysis were performed according to widely accepted standard protocols employing strict quality assurance/quality control procedures. The results of the pre-regulation effluent monitoring exercise are documented in the report on Ontario Pulp and Paper Mills Effluent Composition[1] and in the Development Document for the Effluent Monitoring Regulation for the MISA Pulp and Paper Sector[2].

Table 3.1 lists the parameters that were identified as being present in mill effluent following initial screening of the pre-regulation effluent monitoring data by industry.

The screening criteria used by industry eliminated any parameter for which the average of the reported concentrations from the four rounds of effluent sampling was less than the method detection limit and for which the values reported for the effluent samples were less than twice those reported for the intake water samples.

MISA Effluent Monitoring

The effluent monitoring data for the MISA Pulp and Paper Sector were collected under Ontario Regulation 435/89 as amended to Ontario Regulation 202/90. The twenty-seven direct discharge mills in Ontario were required to monitor their effluent for a one year period starting on January 1, 1990.

The Effluent Monitoring Regulation required each mill to monitor for up to 135 parameters on a daily, thrice weekly, weekly, monthly, bi-monthly and semi-annual basis. Process effluent, cooling water effluent, storm water effluent, emergency overflow effluent, backwash effluent and waste disposal site effluent were monitored at each mill and intake water was monitored on a voluntary basis by nine of the mills.

The Development Document for the Effluent Monitoring Regulation for the MISA Pulp and Paper Sector[2] outlines the rationale that was used in the development of the Effluent Monitoring Regulation. The Development Document explains why each parameter was monitored and explains the frequency of monitoring.

The twelve months of effluent monitoring generated 191,932 data points, including 46,646 quality assurance/quality control data points. Table 3.2 lists the number of data points and total number of effluent sampling points for each effluent stream type.

Table 3.1
Pre-Regulation Effluent Monitoring Results Reported by Industry

ATG	Name	Parameter
2	Total Cyanide	Total Cyanide
4a	Nitrogen	Total Kjeldahl Nitrogen
6	Total Phosphorus	Total Phosphorus
9	Total Metals	Aluminum Cadmium Chromium Copper Lead Nickel Thallium Zinc
12	Mercury	Mercury
16	Volatiles, Halogenated	1,1,1-Trichloroethane 1,1-Dichloroethane 1,2-Dichlorobenzene 1,2-Dichloroethane 1,2-Dichloropropane 1,3-Dichlorobenzene 1,4-Dichlorobenzene Bromodichloromethane Carbon Tetrachloride Chlorobenzene Chloroform Dibromochloromethane Tetrachloroethylene Trichloroethylene
17	Volatiles, Non-Halogenated	Benzene Ethylbenzene Toluene
19	Extractables, Base Neutral	Acenaphthylene Fluoranthene Naphthalene Phenanthrene
20	Extractables, Acid (Phenolics)	2,4,6 -Trichlorophenol 2,4-Dichlorophenol Phenol

Table 3.1 (cont'd)
Pre-Regulation Effluent Monitoring Results Reported by Industry

ATG	Name	Parameter
29	Open Characterization - Elemental	Calcium Magnesium Potassium Sodium
M1	Chloride	Chloride
M6	Sulphate	Sulphate
	Ammonia-Nitrogen	Ammonia-Nitrogen
	Nitrate	Nitrate
	Nitrite	Nitrite

Table 3.2
Data and Sampling Points

Effluent or Sample Type	Number of Sampling Points	Number of Data Points
Process	29	125,408
Cooling Water	14	4,565
Backwash	3	196
Storm Water	46	2,897
Waste Disposal Site	1	578
Emergency Overflow	9	1,474
Intake (not required by the regulation)	9	10,168
Quality Assurance/Quality Control Data	N/A	46,646
Total	111	191,932

Legend
N/A = not applicable

Note
Data reflects finalized Ministry database (downloaded on May 31, 1991).

3.2 DATA VALIDATION

In order to confirm the integrity of the information contained in the effluent monitoring database, it was necessary to conduct a rigorous data validation exercise. Data validation involved the following:

Units Verification

The data were analyzed to ensure that the correct units were reported for each parameter for the entire monitoring period. Where the use of incorrect units was identified, direct dischargers were required to resubmit the data with the correct units. The use of data with incorrect units could produce a large error in the calculation of parameter loadings.

Multiple Record Identification

The data were analyzed to determine whether two or more records existed for the same parameter for the same control point for the same day. When multiple records were identified, the incorrect records were removed from the database. The presence of incorrect records could adversely affect the calculation of parameter loadings.

Sample Type Code Verification

Sample type codes were reviewed in order to ensure that the appropriate sampling procedures were used to collect samples for the analysis of sulphides, and halogenated and non-halogenated volatiles. The proper method of sampling for the analysis of parameters in these analytical test groups is the collection of a three grab composite sample (equal volume (bucket), or equal volume (slipstream to valve)).

In some cases incorrect sample type codes were reported although the sample had been collected using the correct sampling procedure. All erroneous sample type codes were corrected.

Remark Code Verification

Remark code usage was checked to ensure that the data were correctly identified and labelled. Dischargers were required to resubmit effluent monitoring data that were labelled incorrectly.

An investigation of the remark codes used by the industry showed that approximately 4.5% of the database could not be used for data analysis or limit setting purposes because the remark codes used by the dischargers indicated that the data were unreliable. Effluent monitoring data with the following remark codes were not used: "N/A", "!IN", "!NM", "I", "IC", "IM", "OLD", "UQC", "UCR", "<", "<WE", and "AR".

Effluent monitoring data with the remark codes "<DL", "<T", and "<W" (approximately 23.5% of the database) were used according to the procedures outlined in the draft Issue Resolution Committee reports on data analysis. These data were used as reported unless the reported value was less than the Regulation Method Detection Limit (RMDL) divided by 10 in which case the RMDL/10 value was used. Data with remark codes "<" and "A" or with no remark code were used as reported.

Table 3.3 lists the remark code definitions for the remark codes used during the effluent monitoring period for the MISA Pulp and Paper Sector.

Attached Report Investigation

All of the effluent monitoring data with the attached report, "AR", remark code were investigated during the data validation exercise.

Since only 0.2% of the database contained records with the "AR" remark code, it was decided that for parameters sampled at relatively high frequencies, these data would not be considered during subsequent data analysis.

For parameters sampled at relatively low frequencies, data with the "AR" remark code were further investigated and data submissions were requested as necessary.

Table 3.3
Remark Codes

Remark Code	Description
<	Actual amount less than reported
>	Actual amount probably greater than reported
A	Approximate value
<DL	Reported value = MDL: measured amount MDL (non-zero)
<T	A measurable trace amount: interpret with caution
<W	No measurable response (zero): reported value
<WE	No measurable response (dilution/concentration): reported value
AR	Attached report
I	Interference suspected
IC	Interference: Colour
IM	Interference: Sample Matrix
N/A	No data will be reported: see textual report
OLD	Old: sample exceeds maximum storage time
UQC	Data unreliable: possible lab QC problem(s)
UCR	Data unreliable: could not confirm by reanalysis
!IN	No data: insufficient volume due to inspection
!NM	No effluent: no sample available
?	Late data: data not yet available

Database Completeness Confirmation

The number of data points for each control point were totalled for each month in order to determine the completeness of the effluent monitoring database. The total point count was monitored throughout the data collection period to ensure that the database was as complete as possible.

Outlier Investigation

Statistical data outliers were identified according to the general procedures outlined in the draft Issues Resolution Committee Reports. Outlier values were examined to ensure that all data points were correctly reported and that the outlier values were not the result of data entry error. Direct discharges with outlier values due to data entry error were required to resubmit the correct values.

Validated MISA effluent monitoring data results have been published in two 'preliminary' reports. The first report, the "Preliminary Report on the First Six Months of Process Effluent Monitoring in the MISA Pulp and Paper Sector (January 1, 1990 to June 30, 1990)", was published in February 1991. The second report, the "Preliminary Report on the Second Six Months of Process Effluent Monitoring in the MISA Pulp and Paper Sector (July 1, 1990 to December 31, 1990)", was published in September 1991.

3.3 CANDIDATE PARAMETER SELECTION

Following data validation, the selection criteria identified in the draft Issue Resolution Committee reports on limit setting and data analysis were used to determine candidate parameters for effluent limits. Parameters were deleted from further consideration if the effluent monitoring data showed (at a 95% confidence level) that a statistical portion of 0.9 of the data were at a concentration of less than the RMDL.

A total of 77 parameters were identified as candidate parameters for limit setting for the sulphate (kraft) category, 43 for the sulphite/mechanical category, 38 for the corrugating category and 49 for the deinking/board/fine papers/tissue category. The parameter pH was not included in candidate parameter selection since it will be regulated within the range specified in the Effluent Limits Regulation.

3.4 QA/QC DATA ASSESSMENT

Purpose Of QA/QC Data Assessment

In order to assess the quality of the effluent monitoring data submitted under the Effluent Monitoring Regulation, pulp and paper mills were required to submit quality assurance and quality control (QA/QC) data. The QA/QC data assessment process evaluated the suitability of the effluent monitoring data for use in the effluent limit setting process.

The QA/QC data consisted of field QA/QC data submitted by each mill and internal laboratory QA/QC data kept on file at each laboratory that performed sample analysis. Field QA/QC data included the results of travelling blanks, travelling spiked blanks, duplicates and uncorrected effluent monitoring samples for specified analytes, collected at specified locations and at specified frequencies. The laboratory QA/QC data consisted of the results of certain laboratory QA/QC checks (blanks, spiked blanks, spiked samples, and replicate analyses as specified in the MISA General Effluent Monitoring Regulation) that were retained by the laboratories for possible audit/review by the Ministry.

The importance of the collection and assessment of the QA/QC data was threefold. Firstly, it served to identify and assess the significance of analytical biases, chronic contamination, data variability, false results (either positive or negative) and field sampling or laboratory analytical problems. Secondly, the collection and assessment of the QA/QC data was one of the processes necessary to determine the validity of the data reported in the effluent monitoring database and thirdly, it evaluated the comparability of the data submitted by different laboratories and mills.

Method of QA/QC Data Assessment

The QA/QC data assessment process used in evaluating the effluent monitoring data for the pulp and paper sector followed the general approach outlined in the draft Issue Resolution Committee reports. The approach consists of the following steps:

- The retrieval and screening of all field QA/QC data (travelling blanks, travelling spiked blanks, duplicates, and corrected and uncorrected effluent monitoring data) for a particular mill, and all the corresponding effluent monitoring data for each process effluent stream at the mill.

- The sorting and summarizing of the QA/QC data and effluent monitoring data.

- The evaluation of the QA/QC data and effluent monitoring data based on the procedures outlined in the draft Issues Resolution Committee reports.

Primary emphasis was placed on the evaluation of the QA/QC data for selected parameters. The remaining parameters were investigated for possible false negative results by examining the recovery levels of the travelling spiked blanks to check for under-recoveries.

The QA/QC data assessment process is described in detail in the Report on the Analysis of the Quality Assurance and Quality Control Data for the MISA Pulp and Paper Sector[3].

Results of QA/QC Data Assessment

Based on the QA/QC data assessment the parameters presented in Table 3.4 were removed from further consideration in the effluent limit setting exercise.

Tables 3.5 to 3.8 present the candidate parameters selected for each category following QA/QC data assessment and identify the quality of the effluent monitoring data for each parameter.

The QA/QC data assessment confirmed that the majority of the effluent monitoring data for the MISA Pulp and Paper Sector is of reliable quality and is satisfactory for use in the development of effluent limits.

3.5 EFFLUENT MONITORING RESULTS

The 1990 MISA effluent monitoring data provide the most comprehensive characterization of pulp and paper mill effluent in the world. The data are presented in The Twelve Month Report, in Appendix II of the Development Document. Table 3.9 presents the average daily loadings (kg/day) of the parameters that were monitored daily, thrice-weekly and weekly in MISA pulp and paper sector process effluent. A brief description of each parameter, environmental significance and 1990 MISA discharge levels is presented below.

Table 3.4
Parameters Removed Following QA/QC Data Assessment

Analytical Test Group	Parameter	Category K	Category M	Category C	Category D
9	Molybdenum	▒			
	Thallium	▒			
	Vanadium	▒		▒	
16	1,2-Dichloroethane	▒	▒		▒
	Bromodichloromethane		▒		
	Methylene chloride	▒	▒		▒
19	Benzo(k)fluoranthene	▒	▒		
	Benzo(g,h,i)perylene	▒	▒		
	Dibenz(a,h)anthracene	▒	▒		
20	2,3,5-Trichlorophenol	▒			
23	1,2,3,4-Tetrachlorobenzene	▒			
	1,2,3,5-Tetrachlorobenzene	▒			
	1,2,3-Trichlorobenzene	▒	▒		
	1,2,4,5-Tetrachlorobenzene	▒			
	1,2,4-Trichlorobenzene		▒		
	2,4,5-Trichlorotoluene		▒		
	Hexachlorobenzene	▒			
	Hexachlorobutadiene	▒			
	Hexachlorocyclopentadiene	▒			▒
	Hexachloroethane	▒			
	Octachlorostyrene	▒			
	Pentachlorobenzene	▒	▒		
24	Total H6CDF				▒
	Total H7CDF	▒			

<u>Legend</u>

K = Sulphate (Kraft)
M = Sulphite-Mechanical
C = Corrugating
D = Deinking/Board/Fine Papers/Tissue
▒ = Parameter removed due to QA/QC assessment for the category.

Table 3.5
Sulphate (Kraft) Category QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number								
		6	8	9	10	11	14	16	19	21
1	COD	1	1	1	1	1	.	1	1	1
4a	Ammonia plus Ammonium		1		1	1	1	1	1	1
	Total Kjeldahl Nitrogen	1	1	1	1	1	1	1	1	1
4b	Nitrate + Nitrite		1		1				1	1
5a	DOC	.	.	.	.	.	1	.	.	.
6	Total phosphorus	1	1	1	1	1	1	1	1	1
7	Specific conductance	1	1	1	1	1	1	1	1	1
8	Total suspended solids	1	1	1	1	1	1	1	1	1
	Volatile Suspended Solids	1	1	.	.	.	1	.	1	.
9	Aluminum	1	1	1	1	1	1	1	1	1
	Chromium		.	1				1	1	
	Copper	1		1	1		1	1	1	1
	Nickel						1	1	1	
	Zinc	1	1	1	1	1	1	1	1	1
12	Mercury							1		
15	Sulphide	1	1	1	1	1	1	1	1	1
16	Bromodichloromethane				1	.				
	Chloroform	1	2	1	1	1	1	2	1	1
17	Benzene				1	.	1			1
	Styrene				1	.				3
	Toluene	1			1	.	1			1
19	Acenaphthylene				1					
	Camphene	1						1		1
	Chrysene				1					
	Fluoranthene				1					
	Naphthalene				1					
	Phenanthrene				1					
	Pyrene				1					
20	2,4,6-Trichlorophenol	1		1		1	1		1	3
	2,4-Dichlorophenol	1	1	1					1	3
	Phenol			2	3	1				1
	m-Cresol									1
	o-Cresol	1			1					
	p-Cresol									1

Table 3.5 (cont'd)
Sulphate (Kraft) Category QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number								
		6	8	9	10	11	14	16	19	21
23	1,2,4-Trichlorobenzene									2
	2,4,5-Trichlorotoluene									3
24	2,3,7,8 TCDD								1	
	Total TCDD							1	1	
	Total TCDF	1	1	1	1		1	1	1	3
	Total PCDD							1	1	
	Total PCDF							1	1	
	Total H6CDD								1	
	Total H6CDF							1		
	Total H7CDD							2		
	Octachlorodibenzo-p-dioxin	1		1	1	1		1	1	
	Octachlorodibenzofuran							1	1	
26	Abietic Acid	1	1	1	1	1		1	1	1
	Chlorodehydroabietic Acid	2	1	1	1			1	1	1
	Dehydroabietic Acid	1	1	1	1	1	1	1	1	1
	Dichlorodehydroabietic Acid	1	1	1	1	1		1	1	1
	Isopimaric Acid	1	3	1	1	2		1		1
	Levopimaric Acid	1	1	1	1	.		1		1
	Neoabietic Acid	1	2	1	1	1		1		1
	Oleic Acid	1	1	1	1	1		1	1	
	Pimaric Acid	1	3	1	1	1		1		1
M8	BOD, 5 day, Total Demand	1	1	1	1	1	1	1	1	1
M13	Adsorbable Organic Halide	1	1	1	1	1	1	1	1	1

QA/QC LEGEND

1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
. = not monitored at this mill

COMPANY NUMBER LEGEND

6 = Boise (Fort Frances)
8 = CP (Dryden)
9 = CP (Thunder Bay)
10 = Domtar (Cornwall)
11 = Domtar (Red Rock)
14 = E.B. Eddy (Espanola)
16 = James River
19 = Kimberly-Clark (Terrace Bay)
21 = Malette

Table 3.6
Sulphite-Mechanical Category QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number								
		1	2A	2B	3	4	7	23	24	25
1	COD	.	.	.	.	.	1	.	1	1
4a	Ammonia plus Ammonium			1	1			1		
	Total Kjeldahl Nitrogen	1	1	1	1	1	1	1	1	1
4b	Nitrate + Nitrite	1			1	1	1	1		
5a	DOC	1	1	1	1	1		1	.	.
6	Total phosphorus	1	1	1		1	1	1	1	1
7	Specific conductance	1	1	1	1	1	1	1	1	1
8	Total suspended solids	1	1	1	1	1	1	1	1	1
	Volatile Suspended Solids	.	.	.	.	.	.	1	.	.
9	Aluminum	1	1	1	1	1	1	1	1	1
	Copper	1	1	1			1	1	1	1
	Zinc	1	1	1	1	1	1	1	1	2
16	Chloroform	1	2	2	1	1	1	1	1	1
	Chloromethane								2	.
17	Benzene	3			2	3			3	.
	Styrene				1					.
	Toluene	3	1	1	1	1		1	3	1
	o-Xylene			1	1					.
19	Camphene	1		1						
20	Phenol	1	2	2		1			1	1
	m-Cresol	1	1	1		1				
	p-Cresol		1	1		1			1	
24	Octachlorodibenzo-p-dioxin		1	1		3	1		1	1
	Octachlorodibenzofuran	1								

Table 3.6 (cont'd) Sulphite-Mechanical Category QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number								
		1	2A	2B	3	4	7	23	24	25
26	Abietic Acid	1	1	1	1	1	1		1	1
	Chlorodehydroabietic Acid						2			2
	Dehydroabietic Acid	1	1	1	1	1	1	1	1	1
	Isopimaric Acid	1	1	1	1	1	1		1	1
	Levopimaric Acid	1	1	1		1	1		1	.
	Neoabietic Acid	1	1	1		1	1		1	1
	Oleic Acid	1	1	1		1	1		1	1
	Pimaric Acid	1	1	1	1	1	1		1	1
M8	BOD, 5 day, Total Demand	1	1	1	1	1	1	1	1	1

QA/QC LEGEND

1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
. = not monitored at this mill

COMPANY NUMBER LEGEND

1 = AP (I. Falls)
2A = AP (Ft.W) - Control Point 0100
2B = AP (Ft.W) - Control Point 0200
3 = AP (PP)
4 = AP (Thunder Bay)
7 = Boise (Kenora)
23 = Quebec & Ontario
24 = St. Marys
25 = Spruce Falls

Table 3.7
Corrugating Category QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number		
		13	20A	20B
1	COD	1	.	.
4a	Ammonia plus Ammonium	1	3	3
	Total Kjeldahl Nitrogen	1	3	3
4b	Nitrate + Nitrite	1	3	3
5a	DOC	.	3	3
6	Total phosphorus	1	3	3
7	Specific conductance	1	3	3
8	Total suspended solids	1	3	3
	Volatile Suspended Solids	.	.	3
9	Aluminum	1	3	3
	Cadmium	1	3	3
	Chromium	1	3	3
	Cobalt		3	3
	Copper	1	3	3
	Lead		3	3
	Molybdenum			3
	Nickel			3
	Thallium		3	3
	Zinc	1	3	3
16	Chloroform	1		
20	Phenol	1		
	o-Cresol	1		
24	Total TCDF	1		
	Total H6CDD	1		
	Total H7CDD	1		
	Total H7CDF	1		
	Octachlorodibenzo-p-dioxin	1		
	Octachlorodibenzofuran	1		

Table 3.7 (cont'd)
Corrugating Category QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number		
		13	20A	20B
26	Abietic Acid	1		3
	Chlorodehydroabietic Acid	2	3	3
	Dehydroabietic Acid	1	3	3
	Isopimaric Acid	1	3	3
	Levopimaric Acid		3	3
	Neoabietic Acid	1	3	
	Oleic Acid	1	3	3
	Pimaric Acid	1	3	3
M8	BOD, 5 day, Total Demand	1	3	3

QA/QC LEGEND

1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
. = not monitored at this mill

COMPANY NUMBER LEGEND

13 = Domtar (Trenton)
20A = MacMillan - Control Point 1200
20B = MacMillan - Control Point 1300

Table 3.8
Deinking/Board/Fine Papers/Tissue Category QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number							
		5	12	15	17	18	22	26	27
1	COD	.	1	1	1	1	.	1	1
4a	Ammonia plus Ammonium			1				1	
	Total Kjeldahl Nitrogen	1	1	1	1	1	1	1	1
4b	Nitrate + Nitrite		1	1			1		
5a	DOC	1		.	.	.	1	.	.
6	Total phosphorus	1			1	1	1	1	1
7	Specific conductance	1	1	1	1	1	1	1	1
8	Total suspended solids	1	1	1		1	1	1	1
	Volatile Suspended Solids	.	.	.	.	.	1	1	.
9	Aluminum	1	1	1	1	1	1	1	1
	Chromium								1
	Copper	3	1	1	1		1		1
	Zinc	3	3	1	1	1	1	3	1
16	1,1-Dichloroethane					1			3
	1,1-Dichloroethylene	3							1
	Bromodichloromethane						1		
	Chloroform		1	1	1		2	3	1
	Dibromochloromethane						1		
	Tetrachloroethylene					1			
	Trichloroethylene					1			
17	Benzene	3	1				3		1
	Toluene	1				1		1	1
	m-Xylene and p-Xylene	3					1		
	o-Xylene	1					1		
19	2-Methylnaphthalene					1			
	Naphthalene			1		1			1
20	Pentachlorophenol								1
	Phenol	1				1		3	1
	m-Cresol							1	2
	p-Cresol							3	
23	1,2,3,4-Tetrachlorobenzene			1					
	1,2,3-Trichlorobenzene			1					
	1,2,4-Trichlorobenzene			2					
24	Total TCDF					1			
	Octachlorodibenzo-p-dioxin	1			3	.	1		

Table 3.8 (cont'd)
Deinking/Board/Fine Papers/Tissue Category QA/QC Data Assessment

Analytical Test Group	Parameter	Company Number							
		5	12	15	17	18	22	26	27
26	Abietic Acid	3	1	3		1			1
	Chlorodehydroabietic Acid		2						2
	Dehydroabietic Acid	1	1	1		1	1	1	1
	Isopimaric Acid	1	1			1			1
	Levopimaric Acid	3	1			1			
	Neoabietic Acid	2							
	Oleic Acid	3				3		3	1
	Pimaric Acid	1	1	3		1		1	3
M8	BOD, 5 day, Total Demand	1	1	1	1	1	1	1	1
M13	Adsorbable Organic Halide	.	.	.	.	.	1	.	.

QA/QC LEGEND

1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
. = not monitored at this mill

COMPANY NUMBER LEGEND

5 = Beaver Wood
12 = Domtar (St. Catharines)
15 = E.B. Eddy (Ottawa)
17 = Kimberly-Clark (Huntsville)
18 = Kimberly-Clark (St. Catharines)
22 = Noranda
26 = Strathcona
27 = Trent Valley

Table 3.9
Average Daily Loadings (kg/day)

Parameter	Sulphate (Kraft) Category	Sulphite-Mechanical Category	Corrugating Category	Deinking/ Board/ Fine Papers/ Tissue Category	MISA Pulp and Paper Sector
Adsorbable Organic Halide (AOX)	15,493	-----	-----	115	15,608
Aluminum	1,867	503	25	172	2,567
Ammonia plus Ammonium	678	133	132	12	955
BOD, 5 day, Total Demand	120,268	172,864	37,142	9,773	340,047
COD	508,068	191,185	12,009	17,504	728,766
DOC	11,725	91,612	32,394	2,755	138,533
Dehydroabietic Acid	553	951	7	36	1,547
Dichlorodehydroabietic Acid	43	-----	-----	-----	43
Nitrate + Nitrite	1,110	68	6,796	20	7,994
Total Kjeldahl Nitrogen	2,894	1,034	533	184	4,645
Total phosphorus	604	182	58	9	853
Total suspended solids	57,971	31,960	3,247	3,894	97,072
Volatile suspended solids	20,195	2,309	1,857	956	25,317
Zinc	89	41	10	10	150

----- = not monitored for this category

Adsorbable Organic Halide (AOX)

Adsorbable Organic Halide (AOX) was selected as a candidate parameter for ten mills. AOX is an approximate measure of the total chlorinated organic material in pulp and paper mill effluent. The reaction of chlorine and chlorine-containing compounds with lignin residuals from wood cooking, produces organochlorine compounds. These compounds have many forms of which over three hundred have been identified.

A major fraction of AOX consists of chemically unstable or readily biodegradable materials, which are easily mineralized in a biological effluent treatment plant. The materials which are not mineralized during biological treatment are more persistent in the environment. Approximately 0.1% of AOX consists of bioaccumulative compounds, including chlorinated dioxins and furans.

The nine sulphate (kraft) mills that use chlorine and chlorine compounds to bleach kraft pulp were required to monitor AOX three times weekly under the effluent monitoring regulation. The Noranda Forest mill in Thorold was also required to monitor AOX because it uses elemental chlorine and hypochlorite to brighten deinked pulp. The total 1990 average daily discharge of AOX was 15,608 kg/day with the majority of AOX (15,493 kg/day) being discharged by the sulphate (kraft) mills.

Aluminum

Aluminum was selected as a candidate parameter for all of the twenty-seven direct discharge mills. Alum and other aluminum salts are used in the papermaking process as conditioners and are added to biological treatment systems to precipitate suspended solids and phosphorus. At higher concentrations, aluminum is known to be toxic and in natural water concentrations in excess of 0.1 mg/L, aluminum is known to be deleterious to the growth and survival of fish. The total 1990 average daily discharge of aluminum was 2,567 kg/day with the majority of aluminum (1,867 kg/day) being discharged by the sulphate (kraft) mills.

Ammonia plus Ammonium

Ammonia plus ammonium was selected as a candidate parameter for fourteen of the twenty seven mills. Ammonia plus ammonium measures ionized and un-ionized ammonia. Ammonia is added to biological treatment plants in order to maximize BOD removal efficiency. Un-ionized ammonia is toxic to fish and its impact on the aquatic environment is well known and documented. The total 1990 average daily discharge of ammonia and ammonium was 955 kg/day with the majority of ammonia and ammonium (678 kg/day) being discharged by the sulphate (kraft) mills.

Biochemical Oxygen Demand

Biochemical oxygen demand (BOD) was selected as a candidate parameter for all of the mills. Biochemical oxygen demand is not a substance or a pollutant but rather a quality or characteristic of the effluent. The level of BOD in effluent can be of importance for discharges to receiving waters that are vulnerable to oxygen depletion.

BOD_5 is a measure of the oxygen consumed in a sample over a 5 day period by the action of microorganisms. The total 1990 average daily discharge of BOD_5 was 340,047 kg/day with the majority of BOD (172,864 kg/day) being discharged by the sulphite-mechanical mills.

Chemical Oxygen Demand

Chemical oxygen demand (COD) was selected as a candidate parameter for the eighteen mills that monitored for it. The chemical oxygen demand of a biologically treated effluent represents the fraction of organic substances in an effluent that the natural ecosystem cannot readily degrade. COD, however, provides no indication as to whether or not these substances are harmful or toxic.

Approximately 40% of the COD in pulp and paper mill effluent can be removed with biological effluent treatment although this removal level can be quite unpredictable. Internal process measures are generally more efficient at reducing COD. The difference between BOD and COD values for a given sample provides an indication of the presence of refractory materials.

The total 1990 reported average daily discharge of COD was 728,766 kg/day.

Dissolved Organic Carbon

Dissolved organic carbon (DOC) was selected as a candidate parameter for the nine mills that monitored for it. Dissolved organic carbon, like COD measures the fraction of the organic substances in an effluent that the natural ecosystem cannot readily degrade. The DOC test is faster, more precise and easier to perform than the COD test and is the best way to measure non-biodegradable compounds.

The total 1990 reported average daily discharge of DOC was 138,533 kg/day.

Dehydroabietic Acid

Dehydroabietic acid was selected as a candidate parameter for twenty-six mills. Resin acids are naturally occurring compounds in wood resins, particularly in pine and spruce, that are very toxic to fish.

They are released during mechanical and kraft pulping, however, they may be more concentrated in effluents from mechanical pulping operations than in effluents from chemical pulping operations.

In kraft mill effluents, high concentrations of dehydroabietic acid may indicate soap spills or black liquor carry-over (perhaps poor brown stock washing). Dehydroabietic acid can be reduced by good spill control and biological treatment of mill effluent.

The total 1990 average daily discharge of dehydroabietic acid was 1,547 kg/day with the majority of dehydroabietic acid (951 kg/day) being discharged by the sulphite-mechanical mills.

Dichlorodehydroabietic Acid

Dichlorodehydroabietic acid was selected as a candidate parameter for eight of the nine sulphate (kraft) mills that monitored for it. Dichlorodehydroabietic acid is a chlorinated resin and fatty acid that can be controlled by reducing black liquor carry-over to the bleach plant and by reducing the amount of chlorine and chorine compounds used in bleaching.

Dichlorodehydroabietic acid is more persistent than dehydroabietic acid and is difficult to treat with biological effluent treatment. The total 1990 average daily discharge of dichlorodehydroabietic acid was 43 kg/day.

Nitrate and Nitrite

Nitrate and nitrite was selected as a candidate parameter for fourteen mills. Though nitrate and nitrite exerts a small oxygen demand, it can be a potential drinking water problem and is potentially toxic. Pulp mill effluents have limited levels of nitrate and nitrite therefore, it should not be problem. Nitrate and nitrite can be reduced to atmospheric nitrogen in the anoxic zones of a biological treatment plant.

The total 1990 average daily discharge of nitrate and nitrite was 7,994 kg/day with the majority of nitrate and nitrite (6,796 kg/day) being discharged by the corrugating mills.

Total Kjeldahl Nitrogen

Total Kjeldahl Nitrogen (TKN) was selected as a candidate parameter for all of the twenty-seven mills. Total kjeldahl nitrogen measures ammonia plus ammonium and some organic nitrogen. TKN is reduced in biological effluent treatment and in treated effluent the difference between the levels of TKN and ammonia plus ammonium is a measure of persistent nitrogenous compounds. TKN is not directly related to toxicity and does not define nutrient levels.

The total 1990 average daily discharge of Total Kjeldahl Nitrogen was 4,645 kg/day with the majority of TKN (2,894 kg/day) being discharged by the sulphate (kraft) mills.

Total Phosphorus

Total Phosphorus was selected as a candidate parameter for twenty-four mills. Phosphorus may be present as polyphosphates, orthophosphates or similar compounds in mill effluent and must be added to biological treatment systems for maximum BOD removal efficiency. Excessive discharges of phosphorus can cause eutrophication of receiving waters.

The total 1990 average daily discharge of total phosphorus was 853 kg/day with the majority of total phosphorus (604 kg/day) being discharged by the sulphate (kraft) mills.

Total Suspended Solids

Total suspended solids (TSS) was selected as a candidate parameter for twenty-six mills. TSS is a measure of suspended material, including organic and inorganic material. Suspended solids originate mainly from pulp fibre losses and from the biological solids formed by secondary treatment systems.

Suspended solids have been found in some cases to carry bioaccumulative organic compounds, including polychlorinated dioxins and other toxicants that may adsorb onto the solids.

The majority of suspended solids originating from pulp fibre losses can be removed from the effluent stream by primary treatment. TSS is also one of the most important design parameters for biological effluent treatment systems.

The total 1990 average daily discharge of total suspended solids was 97,072 kg/day with the majority of TSS (57,971 kg/day) being discharged by the sulphate (kraft) mills.

Volatile Suspended Solids

Volatile suspended solids (VSS) was selected as a candidate parameter for the eight mills with biological effluent treatment that measured for it. The VSS test measures organic material like biological solids and the test results for pulp and paper mill effluent correlate closely with TSS test results.

The total 1990 reported average daily discharge of volatile suspended solids was 25,317 kg/day.

Zinc

Zinc was selected as a candidate parameter for all of the twenty-seven mills. Zinc is not used in the pulp and paper making process and it is thought that the main source of zinc in mill effluents is from the wood itself. Zinc may also be present in the natural waters used by the mills.

The total 1990 average daily discharge of zinc was 150 kg/day with the majority of zinc (89 kg/day) being discharged by the sulphate (kraft) mills.

REFERENCES

1. Ontario Forest Industries Association (1988). Ontario Pulp and Paper Mills Effluent Composition. Toronto, Ontario.

2. Ontario Ministry of the Environment (1989). The Development Document for the Effluent Monitoring Regulation for the Pulp and Paper Sector. Toronto, Ontario.

3. Ontario Ministry of the Environment (1992). Report on the Analysis of the Quality Assurance and Quality Control Data for the MISA Pulp and Paper Sector. Toronto, Ontario.

THE BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

CHAPTER 4

OF THE

DEVELOPMENT DOCUMENT

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4.1 BEST AVAILABLE TECHNOLOGY (BAT)

In order to identify the best available technology economically achievable (BATEA) for the Ontario pulp and paper industry the Ministry commissioned a consultant study in January, 1991 to identify best available technology (BAT) and to determine the costs of retrofitting Ontario pulp and paper mills with the identified BAT. The results of the BAT study were subsequently used by the Ministry to conduct an economic impact assessment of imposing the identified BAT on the pulp and paper sector.

The BAT Subcommittee

A Best Available Technology (BAT) subcommittee was formed under the auspices of the MISA Pulp and Paper Sector Joint Technical Committee to recommend to the JTC several BAT options that could be used to determine the best available technology economically achievable. The BAT subcommittee consisted of representatives from the Ministry, Industry and Environment Canada.

The BAT Consultant

The first task of the BAT subcommittee was to select a consultant to conduct the study on best available technology. The BAT subcommittee prepared terms of reference for the study in November, 1990 and a bidders meeting was held on January 3, 1991 to discuss the terms of reference with potential bidders. By January 17, 1991, the bid closing date, the Ministry had received twenty proposals from qualified consultants.

The proposals were reviewed by seven members of the BAT subcommittee on January 18, 19 and 21, 1991 and on February 1, 1991 purchase orders were issued to N. McCubbin Consultants to start the work.

A meeting was held with the consultant on February 13 and 14, 1991 to brief the consultant on the work that had been done by the Ministry and on February 15, 1991 the consultant met with the BAT subcommittee to discuss the project.

Throughout the study, the consultant met monthly with the BAT subcommittee to brief the subcommittee on the progress made on the study. On May 31, 1991, the consultant completed the first draft of the report and forwarded the draft report to the subcommittee for review.

The BAT subcommittee met on June 7 and 8, 1991 to review the draft report. The consensus of the subcommittee was that while the report contained all of the necessary information, it could be better organized and presented. Accordingly, the consultant was asked to prepare a second draft of the report for review by the subcommittee.

On July 10, 1991 the BAT subcommittee met to review the second draft of the BAT report. Further revisions were requested and the consultant was asked to prepare a third and final draft of the report. The final draft of the report was submitted to the Ministry in September, 1991 and was published in February, 1992.

The BAT Study

The objectives of the BAT study were threefold:

- To develop an inventory of best available technology for the control of pulp and paper mill effluent discharges
- To develop an inventory of current technologies used by the twenty-seven direct discharge mills in Ontario for controlling effluent discharges
- To identify several BAT technology train options that can be applied to Ontario mills and to assess technical feasibility, resulting effluent quality, capital costs and operating expenditures.

In order to develop the inventory of best available technology for the control of pulp and paper mill effluent discharges, the consultant had to first identify available pollution control technologies. The consultant developed an initial list of available control technologies based on professional experience, available technologies identified by the US EPA, and extensive scientific literature searches and reviews.

Available Technologies

The BAT consultant reviewed available technologies from around the world including North America, Europe, Australia and Japan. Available technologies were evaluated in terms of their ability to reduce pollutants in the effluent from pulp and paper mills similar to those in Ontario. In evaluating the available technologies, the following aspects were considered:

- Modification of the production process to reduce or eliminate formation of pollutants
- Chemical substitution
- In-plant control measures, including abatement of accidental spills
- Best management practices (BMP)
- Water conservation
- External effluent treatment technologies
- Energy conservation.

The next task of the consultant was to review the list of available technologies and select those technologies that can be considered demonstrated technologies.

Demonstrated Technologies

A demonstrated technology is a technology for which data are available that can be used to predict, with a reasonable degree of confidence, the reliability of the technology with respect to contaminant reductions and effluent variability at any plant in the sector, given the expected variability between plants. It should also be possible to successfully retrofit demonstrated technologies into existing facilities with a reasonable degree of confidence.

The consultant used the following criteria to select demonstrated technologies from the list of available technologies:

- The technology is used in the pulp and paper sector or in a similar industrial sector or sub-sector that produces effluents with similar characteristics

- The technology can be retrofit in at least some of the existing facilities

- The technology has been in commercial use for a significant time, generally at least one year
- Design/sizing and costing information for the technology is available or sufficient information is available to develop it
- Bench or pilot-scale technology can be considered in some cases of specific interest.

BAT Selection

The process for selecting BAT options from the list of demonstrated technologies considered firstly their ability to remove contaminants and secondly the following goals:

- Non-lethal to rainbow trout and Daphnia magna
- Effective use of recycling, re-use and reduction and smallest transfer to other media
- Reduction of AOX in the effluent from bleached kraft mills
- Water conservation

The consultant identified several BAT technology train options for each category of mill in the pulp and paper sector. The options consist of individual process modifications combined with external treatment measures and represent integrated groups of proven, demonstrated control technologies that can be used to improve effluent quality substantially. The BAT technology train options differ in cost and resulting effluent quality and serve as the basis for calculating the costs to reach various levels of effluent quality.

In selecting BAT technology train options for Ontario mills, the consultant assumed that the mills would not modify their production rates or product mix, although this could be a viable option for some of the mills to comply with MISA effluent limits.

The BAT Technology Train Options

The consultant identified five technology train options for sulphate (kraft) mills, three technology train options for sulphite/mechanical mills, three technology train options for corrugating mills and four technology train options for deinking/board/fine papers/tissue mills.

All of the technology train options identified by the BAT consultant include secondary effluent treatment and are based on the premise that the Ontario mills can be retrofitted to discharge an average flow of 50 m^3/tonne of product.

Capital and operating costs have been estimated for the implementation of the appropriate BAT technology train options at each of the Ontario mills. In all cases the costs are based on the mills as they existed in April, 1991 with no attempt made at estimating the extent of prior investments in effluent control.

It should be noted that the BAT technology trains were selected to provide logical, technically sound approaches to reduce effluent discharges. They do not represent the only way of attaining the effluent quality identified nor do they represent the only technically sound way of combining the wide variety of demonstrated effluent discharge control technologies available.

Each BAT technology train is an independent group of effluent control technologies and in most cases it is neither intended nor economically reasonable for a mill to install first one train then the other.

Attainable Effluent Discharges

The BAT consultant believes that technically proven in-plant process modifications to reduce effluent discharges at the source in combination with widely used external treatment processes can reduce pulp and paper wastewater discharges to the levels identified in Table 4.1 regardless of the category of mill.

Table 4.1
Attainable Effluent Loadings With Biological Effluent Treatment (kg/tonne)

Parameter	ASB	AST
BOD, 5 day, Total Demand	1.05	0.55
Total Suspended Solids	2.30	1.05
Total Phosphorus	0.04	0.04
Total Kjeldahl Nitrogen	0.45	0.50

Legend
ASB = aerated stabilization basin effluent treatment
AST = activated sludge effluent treatment

The BAT consultant also believes that if tertiary effluent treatment systems consisting of either chemically assisted coagulation or granular media filtration are added to treat effluent from biological effluent treatment systems then TSS and nutrient discharges can be further reduced by 50% and BOD discharges by 25%.

The Sulphate (Kraft) Category

The BAT technology train options identified for the nine sulphate (kraft) mills in Ontario all include in-plant measures for pollution prevention at source and include the elimination of all hypochlorite bleaching stages to reduce chloroform discharges, in addition to the reductions that result from the substitution of chlorine dioxide and non-chlorine bleaching agents for molecular chlorine.

Table 4.2 briefly summarizes each technology train option and identifies the long-term average AOX loadings that Ontario mills would discharge if the technology train options were retrofitted at each mill.

The technology trains are discussed in more detail below and also in Chapter Seven of the Report on Best Available Technology for the Ontario Pulp and Paper Industry[1].

Table 4.2
Sulphate (Kraft) Category Technology Train Options and Attainable AOX Effluent Loadings

Technology Train	Description	Long-Term Average (kg/tonne)
K1	High chlorine dioxide substitution, ASB	1.9
K2	100% chlorine dioxide substitution, ASB	0.75
K3	Oxygen delignification, ASB	0.6
K4	Extended Cooking, ASB	0.5
K5	Oxygen delignification and extended cooking, AST	0.45

Note: Trains K3 to K5 all have 100% chlorine dioxide

Technology Train K1

Technology train K1 represents the simplest way of complying with the most demanding current Ontario requirements and draft Federal requirements for BOD, TSS, acute toxicity, AOX, PCDDs and PCDFs. Technology train K1 consists of:

- Internal spill control
- Excellent brown stock washing to reduce black liquor carry-over to the bleach plant (Brown stock is unbleached kraft pulp. Black liquor carry-over requires greater use of bleaching chemicals and exerts a high BOD on the effluent treatment system)
- **Sufficiently high substitution of chlorine dioxide for molecular chlorine to reduce emissions of 2,3,7,8-TCDD and 2,3,7,8-TCDF to below a 10 ppq detection level**
- ASB secondary effluent treatment (or AST treatment where there are space constraints)
- Emergency spill containment

Technology Train K2

Technology train K2 is similar to train K1 but completely eliminates the use of molecular chlorine. Train K2 corresponds to the best attainable improvement in effluent quality by internal "reduction at source" measures without modifying the Kappa number (a measure of the lignin in the pulp) entering the bleach plant.

With BAT technology train K2, any hypochlorite bleaching stages would be eliminated and additional chlorine dioxide bleaching equipment would be installed as appropriate. Technology train K2 consists of:

- Internal spill control
- Excellent brown stock washing to reduce black liquor carry-over to the bleach plant
- **Converting the bleach plant to a DE_oDED bleaching sequence** (a five stage bleaching sequence consisting of chlorine dioxide bleaching abbreviated as 'D' followed by oxygen enhanced caustic extraction abbreviated as 'E_o')
- ASB secondary effluent treatment (or AST treatment where there are space constraints)
- Emergency spill containment

Technology Train K3

Technology train K3 is similar to train K2 but with oxygen delignification to reduce the Kappa number of the pulp entering the bleaching process. In oxygen delignification systems, unbleached pulp is fed to a pressurized reactor where gaseous oxygen is added to the pulp to reduce the Kappa number of the pulp by about 50%. Technology train K3 consists of:

- Internal spill control
- Excellent brown stock washing to reduce black liquor carry-over to the bleach plant
- **Oxygen delignification** (medium consistency, as installed in many mills 1980-1991)
- Converting the bleach plant to a $O_{ww}DE_oDED$ bleaching sequence (O_{ww} refers to oxygen delignification followed by two stage pulp washing.)
- ASB secondary effluent treatment (or AST treatment where there are space constraints)
- Emergency spill containment

Technology Train K4

Technology train K4 is similar to train K3 but includes extended cooking instead of oxygen delignification. Extended cooking, like oxygen delignification, is used to reduce the Kappa number of the pulp entering the bleach plant and the results are similar to those attainable with train K3. Technology train K4 consists of:

- Internal Spill Control
- **Extended cooking** (requires new digesters)
- Excellent brown stock washing to reduce black liquor carry-over to the bleach plant
- Converting the bleach plant to a DE_oDED bleaching sequence
- ASB secondary effluent treatment (or AST treatment where there are space constraints)
- Emergency spill containment

Technology Train K5

Technology train K5 is a combination of extended cooking and oxygen delignification and represents the most effective effluent control attainable by demonstrated technology. Technology train K5 consists of:

- Internal Spill Control
- **Extended cooking**
- Excellent brown stock washing to reduce black liquor carry-over to the bleach plant
- **Converting the bleach plant to a $OO_{ww}DE_oD$ bleaching sequence** (OO_{ww} refers to two stage oxygen delignification followed by two stage pulp washing.)
- **Activated sludge effluent treatment**
- Emergency spill containment

The Sulphite-Mechanical Category

The variety of in-plant technology available for effluent discharge prevention at source for these types of mills is quite restricted relative to the kraft mills.

Due to the lack of data on the quality of effluent from aerated stabilization basins treating sulphite-mechanical mill effluent in cold Northern climates, the BAT consultant decided not to include ASB effluent treatment as a BAT option for this mill category. The very few sulphite-mechanical mills similar to those in Ontario which have been required to install secondary effluent treatment, have installed activated sludge treatment.

It should be noted that most newsprint mills in Canada and the Northern United States which have secondary effluent treatment, have abandoned high-yield sulphite pulping operations and now either purchase pulp or produce 100% thermomechanical pulp sheet.

All of the technology train options identified for the mills in the sulphite/mechanical category include activated sludge treatment and two of the options include tertiary effluent treatment by either granular filtration or chemically assisted coagulation. The three technology train options identified for the eight mills in the sulphite-mechanical category are briefly summarized in Table 4.3.

Table 4.3
Sulphite-Mechanical Category Technology Train Options

Technology Train	Description
S1	Activated Sludge Treatment System (AST)
S2	AST, Granular filter
S3	AST, Chemically-aided Coagulation

The sulphite-mechanical technology train options are discussed in more detail below and in Chapter Seven of the report on the Best Available Technology for the Ontario Pulp and Paper Industry.

Technology Train S1

Technology train S1 consists of an activated sludge treatment system (AST) to treat all mill effluent and in-plant process modifications to reduce mill effluent flow to 50 m^3/tonne or lower where appropriate.

Technology Train S2

Technology train S2 is similar to train S1 but includes the addition of a granular filter to reduce suspended solid discharges. By reducing suspended solid discharges, the discharges of the pollutants that tend to travel with the solid fraction of the effluent stream will also be reduced.

Technology Train S3

Technology train S3 is also similar to train S1 but includes the addition of chemically-aided coagulation to reduce the discharges of suspended solids, heavy metals and phosphate. Chemically aided coagulation involves the addition of a coagulant such as alum (aluminum sulphate) to biologically treated effluent prior to tertiary clarification.

The Corrugating Category

There are only two mills in the corrugating category and a limited number of relevant BAT technologies available. The technology train options identified by the BAT consultant are similar to those identified for the sulphite-mechanical category. The three technology train options identified for the two mills in the corrugating category are briefly summarized in Table 4.4.

Table 4.4
Corrugating Category Technology Train Options

Technology Train	Description
C1	Activated Sludge Treatment (AST)
C2	AST, Granular Filter
C3	AST, Chemically-aided Coagulation

The technology train options identified for the corrugating category are discussed in more detail below and in Chapter Seven of the report on the Best Available Technology for the Ontario Pulp and Paper Industry.

Technology Train C1

Technology train C1 involves the installation of an activated sludge treatment system to treat all wastes and in-plant modifications to reduce effluent flow as appropriate.

Technology Train C2

Technology train C2 is similar to train C1 but includes the addition of a granular filter to reduce suspended solid discharges and the pollutants that tend to travel with the solid fraction of the effluent stream.

Technology Train C3

Technology train C3 is also similar to train C1 but includes the addition of chemically-aided coagulation to reduce the discharges of suspended solids, heavy metals and phosphate.

The Deinking/Board/Fine Papers/Tissue Category

The opportunities for effluent flow reduction at source in these mills are generally limited to improving process water management. The alternative technology trains all include effluent flow reduction to under 50 m^3/tonne product by in-plant process modifications. The four technology train options identified for the eight mills in the deinking/board/fine papers/tissue category are briefly summarized in Table 4.5.

Table 4.5
Deinking/Board/Fine Papers/Tissue Category
Technology Train Options

Technology Train	Description
F1	Aerated Stabilization Basin (ASB)
F2	Activated Sludge Treatment (AST)
F3	AST, Granular Filter
F4	AST, Chemically-aided Coagulation

The technology train options identified for the deinking/board/fine papers/tissue category are discussed in more detail below and in Chapter Seven of the report on the Best Available Technology for the Ontario Pulp and Paper Industry.

Technology Train F1

Technology train F1 involves the installation of an aerated stabilization basin where appropriate. The Kimberly-Clark mills at St. Catharines and Huntsville use purchased pulps to produce tissue, crepe paper and fine paper products and because of the types of manufacturing processes used at the mills, they already discharge effluent of better quality than attainable with an ASB. Domtar at St. Catharines, Noranda at Thorold and E.B. Eddy at Ottawa all lack the necessary space to install ASB treatment and being urban locations it would be impractical to do so.

Technology Train F2

Technology train F2 involves the installation of an activated sludge treatment system. The Kimberly-Clark mills at St. Catharines and Huntsville already discharge effluent of equal or better quality than would be attainable with an AST system, therefore it would not be appropriate to install one.

Technology Train F3

Technology train F3 consists of installing an activated sludge treatment system followed by granular filtration to reduce suspended solid discharges and the pollutants that tend to travel with the solid fraction of the effluent stream.

Technology Train F4

Technology train F4 consists of installing an activated sludge treatment system followed by chemically-aided coagulation to reduce the discharges of suspended solids, heavy metals and phosphate.

Technology Train Costs and Attainable Loadings

The BAT consultant estimated the capital and operating costs of applying each of the identified technology train options to Ontario mills. In all cases, the estimated costs are in addition to environmental protection costs incurred by the mills prior to April 1991.

Capital and operating cost estimates for each mill are presented in Tables 4.6 to 4.9 along with the effluent loadings that are attainable with the implementation of each technology train option. In a few cases, the costs are shown as zero because the mill effluent discharges are already below the levels considered to be attainable by the technology train concerned.

The cost calculations are all based on the assumption that the selling price of the product will not be affected by the changes to the mill process that will be undertaken to improve the effluent quality. All of the identified technology train options will produce pulps with substantially the same product quality as the current production but subtle differences will exist. It is impossible to predict the effects of these differences on the selling prices of the pulp.

Capital costs for the various technology train options were calculated considering all of the site-specific information available. Individual estimates were calculated for each mill and for each of the technology train options identified for the mill. Capital costs were calculated for all of the necessary process equipment for discharge prevention at source, main effluent pipelines, pump stations, roads, aeration equipment (including power supply), secondary clarifiers, sludge thickeners and reaction vessels. All of the cost estimates include allowances for related auxiliary equipment such as process controls and lighting.

Capital costs for each element were calculated for an average Ontario rural location on the basis of the capacity of each element. Some special site allowances were added for piles, restricted locations and known high construction labour costs. Engineering design, owner's overhead and contingency are also included in the estimates for each item.

Table 4.6: Predicted Effluent Characteristics and Costs for the Sulphate (Kraft) Category

		Boise Fort Frances	CPFP Dryden	CPFP Thunder Bay	Domtar Cornwall	Domtar Red Rock	Eddy Espanola	James River Marathon	K-C Terrace Bay	Malette Smth. Rock
Base case effluent data (1991, *refer to note*)										
Production rate	t/day	970	965	2,290	726	819	943	425	1,110	297
Bleached product	t/day	573	735	1,279	412	57	943	425	1,110	297
Effluent flow	m^3/day	77,276	91,707	173,931	126,049	95,187	98,577	61,888	95,122	50,664
TSS	kg/day	10,793	5,524	16,000	10,415	6,260	2,745	2,578	4,279	1,512
BOD	kg/day	9,000	3,132	20,793	22,053	15,716	1,689	12,564	1,408	8,310
AOX	kg/day	1,000	2,293	2,683	401	169	841	850	1,931	596
AOX	kg/t	1.7	3.1	2.1	1.	3.	0.9	2.	1.7	2.
Phosphorus	kg/day	136	181	117	43	21	55	40	49	19
TKN	kg/day	742	175	253	355	178	325	191	441	103
Train K1	*Eliminate detectable dioxins*									
Capital cost		$13,127,000	$12,345,000	$38,845,000	$82,764,000	$43,287,000	$15,821,000	$23,456,000	$11,938,000	$24,889,000
O & M costs	$/yr	$2,147,000	$1,560,000	$3,904,000	($3,243,000)	$168,000	$396,000	$1,336,000	$2,042,000	$1,863,000
TSS	kg/day	2,633	2,171	2,290	726	1,843	2,122	956	2,498	666
BOD	kg/day	1,170	965	1,145	363	819	943	425	1,110	296
AOX	kg/day	894	1,392	2,388	235	91	841	805	1,521	438
AOX	kg/t	1.56	1.89	1.87	0.57	1.59	0.89	1.89	1.37	1.47
Phosphorus	kg/day	47	39	40	29	33	38	17	44	12
TKN	kg/day	527	434	500	363	369	424	191	500	133
Train K2	*Eliminate molecular chlorine*									
Capital cost		$26,425,000	$18,964,000	$38,845,000	$84,462,000	$48,454,000	$35,522,000	$31,166,000	$17,281,000	$24,889,000
O & M costs	$/yr	$2,932,000	$3,047,000	$5,845,000	($2,833,000)	$530,000	$2,007,000	$2,661,000	$3,314,000	$2,199,000
TSS	kg/day	2,183	2,171	2,290	726	1,843	2,122	956	2,498	666
BOD	kg/day	970	965	1,145	363	819	943	425	1,110	296
AOX	kg/day	279	479	954	190	20	350	294	627	168
AOX	kg/t	0.49	0.65	0.75	0.46	0.35	0.37	0.69	0.56	0.56
Phosphorus	kg/day	39	39	40	29	33	38	17	44	12
TKN	kg/day	437	434	500	363	369	424	191	500	133

AOX data refers to the production rate of bleached pulp.
Effluent data for "1991" refers to calculated characteristics after projects which were physically committed before April 1991 are completed.
All effluent data shown above are long term averages.
Costs shown in parentheses are negative.

(Table continued on next page)

Table 4.6 (cont'd): Predicted Effluent Characteristics and Costs for the Sulphate (Kraft) Category

		Boise Fort Frances	CPFP Dryden	CPFP Thunder Bay	Domtar Cornwall	Domtar Red Rock	Eddy Espanola	James River Marathon	K-C Terrace Bay	Malette Smth. Rock
Train K3	*Eliminate molecular chlorine (including oxygen delignification)*									
Capital cost		$37,449,000	$33,789,000	$63,936,000	$93,102,000	$45,414,000	$35,522,000	$41,076,000	$45,317,000	$31,665,000
O & M costs	$/yr	$1,828,000	$1,878,000	$2,355,000	($3,471,000)	$429,000	$2,007,000	$1,872,000	$1,005,000	$1,527,000
TSS	kg/day	2,183	2,171	2,290	726	1,843	2,122	956	2,498	666
BOD	kg/day	970	965	1,145	363	819	943	425	1,110	296
AOX	kg/day	183	356	767	148	0	350	234	476	123
AOX	kg/t	0.32	0.48	0.6	0.36	0.	0.37	0.55	0.43	0.41
Phosphorus	kg/day	39	39	32	29	33	38	17	44	12
TKN	kg/day	437	434	400	363	369	424	191	500	133
Train K4	*Eliminate molecular chlorine (including extended cooking)*									
Capital cost		$73,098,000	$74,744,000	$125,362,000	$116,629,000		$119,876,000	$65,255,000	$97,451,000	$52,219,000
O & M costs	$/yr	($1,877,000)	$559,000	($602,000)	($6,485,000)	(Train 4 is not	($1,947,000)	($2,208,000)	($4,833,000)	$1,316,000
TSS	kg/day	2,183	2,171	2,290	726	applicable)	2,122	956	2,498	666
BOD	kg/day	970	965	1,145	363		943	425	1,110	296
AOX	kg/day	160	315	647	100		216	148	446	109
AOX	kg/t	0.28	0.43	0.51	0.24		0.23	0.35	0.4	0.37
Phosphorus	kg/day	39	39	28	29		38	17	44	12
TKN	kg/day	437	434	350	363		424	191	500	133
Train K5	*Eliminate molecular chlorine (including oxygen delignification and extended cooking)*									
Capital cost		$113,042,000	$119,163,000	$153,260,000	$129,433,000		$146,699,000	$85,586,000	$158,633,000	$69,025,000
O & M costs	$/yr	$3,494,000	$7,705,000	$3,691,000	($4,449,000)	(Train 5 is not	$6,896,000	$1,234,000	$1,113,000	$4,129,000
TSS	kg/day	970	965	2,290	726	applicable)	943	425	1,110	296
BOD	kg/day	485	483	1,145	363		472	213	555	148
AOX	kg/day	130	297	568	72		216	110	313	93
AOX	kg/t	0.23	0.4	0.44	0.18		0.23	0.26	0.28	0.31
Phosphorus	kg/day	39	39	28	29		38	17	44	12
TKN	kg/day	485	483	350	363		472	213	555	148

AOX data refers to the production rate of bleached pulp.
Effluent data for "1991" refers to calculated characteristics after projects which were physically committed before April 1991 are completed.
All effluent data shown above are long term averages.
Costs shown in parentheses are negative.

Table 4.7: Predicted Effluent Characteristics and Costs for the Sulphite-Mechanical Category

		A-P Thunder Bay	A-P Fort William	A-P Prov.Paper	A-P Iroquois Falls	Boise Kenora	Q & O Thorold	St. Marys Sault Ste. M.	Spruce Falls Kapuskasing
Production and effluents from MISA 1990 sampling program									
Production rate	tonnes/day	472	371	424	801	929	840	506	978
Effluent flow	m^3/day	44,728	25,658	47,206	62,414	47,786	60,740	33,337	75,806
TSS	kg/day	1,904	1,190	1,594	7,625	3,431	2,932	6,012	7,900
BOD	kg/day	27,344	14,023	4,221	55,817	34,889	1,134	5,701	31,681
Phosphorus	kg/day	9	11	4	33	14	25	25	25
Total Kjeldahl Nitrogen	kg/day	77.3	75.1	55.1	194.	109.2	181.6	36.9	12.06
Train S1	*Activated sludge treatment*								
Capital cost		$31,075,000	$20,591,000	$17,144,000	$42,646,000	$32,589,000	$3,830,000	$15,550,000	$34,948,000
O & M costs	$/year	$3,934,000	$2,639,000	$1,761,000	$6,170,000	$4,614,000	$96,000	$1,957,000	$4,483,000
TSS	kg/day	472	371	424	801	929	840	506	978
BOD	kg/day	236	186	212	401	465	420	253	489
Phosphorus	kg/day	19	15	17	32	37	25	20	39
Total Kjeldahl Nitrogen	kg/day	236	186	212	401	465	181.6	253	489
Train S2	*Activated sludge treatment plus granular filter*								
Capital cost		$36,637,000	$25,240,000	$22,279,000	$50,912,000	$41,831,000	$12,397,000	$21,408,000	$44,555,000
O & M costs	$/year	$4,067,000	$2,795,000	$1,838,000	$6,497,000	$5,118,000	$462,000	$2,185,000	$4,896,000
TSS	kg/day	236	186	212	401	465	420	253	489
BOD	kg/day	165	130	148	280	325	294	177	342
Phosphorus	kg/day	9.4	7.4	8.5	16.0	18.6	16.8	10.1	19.6
Train S3	*Activated sludge treatment plus chemically assisted coagulation*								
Capital cost		$34,999,000	$23,890,000	$20,776,000	$48,412,000	$39,016,000	$9,800,000	$19,677,000	$41,622,000
O & M costs	$/year	$4,574,000	$3,194,000	$2,294,000	$7,358,000	$6,117,000	$1,365,000	$2,729,000	$5,947,000
TSS	kg/day	236	186	212	401	465	420	253	489
BOD	kg/day	165	130	148	280	325	294	177	342
Phosphorus	kg/day	9.4	7.4	8.5	16.0	18.6	16.8	10.1	19.6

All effluent data shown above are long term averages.
For Quebec and Ontario Paper Company, train 1 consists of the existing UNOX system with reduced flow. The predicted effluent quality must be considered as indicative only
TKN discharges are omitted for trains 2 and 3 due to lack of available data on performance. The values obtained will be somewhat lower than for train 1.

Table 4.8: Predicted Effluent Characteristics and Costs for the Corrugating Category

		Domtar Trenton	**MacMillan Sturgeon Falls**
Base Case Effluent Data *(refer to note)*			
Production rate	t/day	327	274
Effluent flow	cu. m/day	4,015	13,698
TSS	kg/day	574	2,633
BOD	kg/day	5,258	19,655
Phosphorus	kg/day	3	28
Total Kjeldahl Nitrogen	kg/day	24	328
Train C1	*Activated sludge system*		
Capital cost		$10,475,000	$16,850,000
O & M costs	$/year	$2,056,000	$2,614,000
TSS	kg/day	88	274
BOD	kg/day	44	137
Phosphorus	kg/day	4	11
Total Kjeldahl Nitrogen	kg/day	44	137
Train C2	*Activated sludge system plus granular filter*		
Capital cost		$12,091,000	$20,565,000
O & M costs	$/year	$2,104,000	$2,765,000
TSS	kg/day	44	137
BOD	kg/day	31	96
Phosphorus	kg/day	1.8	5.5
Train C3	*Activated sludge system plus chemically assisted coagulation*		
Capital cost		$11,665,000	$19,505,000
O & M costs	$/year	$2,198,000	$3,059,000
TSS	kg/day	44	137
BOD	kg/day	31	96
Phosphorus	kg/day	1.8	5.5

Base case effluent data were estimated by the authors to reflect all projects to improve effluent which were physically committed before April 1991.

Table 4.9: Predicted Effluent Characteristics and Costs for the Deinking/Board/Fine Papers/Tissue Category

		Beaver Thorold	Domtar St. Catharines	Eddy Ottawa	Noranda Thorold	K-C St. Catharines	K-C Huntsville	Trent Valley Trenton	Strathcona Napanee
Production and effluents from MISA 1990 sampling program									
Production rate	tonnes/day	225	161	166	270	108	100	305	178
Effluent flow	m^3/day	15,121	10,473	7,599	20,775	7,736	878	3,659	3,869
TSS	kg/day	759	423	560	1,000	59	5	514	243
BOD	kg/day	1,753	1,193	1,176	3,236	324	3	1,517	608
Phosphorus	kg/day	0.9	0.2	0.3	2.0	1.0	0.3	1	1.6
Total Kjeldahl Nitrogen	kg/day	33.2	19.5	30.9	31	19.5	5.8	13.7	39.3
Train F1	*(Refer to note)*	ASB	AST	AST	AST	None	ASB (exists)	ASB	ASB (exists)
Capital cost		$3,395,000	$6,489,000	$6,775,000	$10,652,000	$0	$0	$3,099,000	$500,000
O & M costs	$/year	$335,000	$978,000	$979,000	$1,296,000	$0	$0	$330,000	$53,000
TSS	kg/day	506	161	176	270	59	5	192	203
BOD	kg/day	225	81	88	135	169	3	85	90
Phosphorus	kg/day	9	6.4	7.1	10.8	1.0	0.3	3.4	1.6
Total Kjeldahl Nitrogen	kg/day	101	81	88	135	19.5	5.8	38	41
Train F2	*Activated sludge treatment*								
Capital cost		$7,387,000	$6,489,000	$6,775,000	$10,652,000	$0	$0	$6,591,000	$4,703,000
O & M costs	$/year	$1,036,000	$978,000	$979,000	$1,296,000	$0	$0	$1,007,000	$970,000
TSS	kg/day	225	161	176	270	59	5	85	47
BOD	kg/day	113	81	88	135	169	3	43	23
Phosphorus	kg/day	9	6.4	7.1	10.8	1.0	0.3	3.4	1.9
Total Kjeldahl Nitrogen	kg/day	113	81	88	135	19.5	5.8	43	23

All effluent data shown above are long term averages.
Train 1 uses the aerated stabilisation basins where space is available on the mill site. Otherwise activated sludge treatment is used.
For trains 2, 3 and 4, the process is uniform for all mills, unless no installation at all is required, so the process is not specified in each column.
K-C, St. Catharines mill effluent BOD was reduced as indicated after the 1990 MISA monitoring program by measures initiated by the company

(Table continued on next page)

Table 4.9 (cont'd): Predicted Effluent Characteristics and Costs for the Deinking/Board/Fine Papers/Tissue Category

		Beaver Thorold	Domtar St. Catharines	Eddy Ottawa	Noranda Thorold	K-C St. Catharines	K-C Huntsville	Trent Valley Trenton	Strathcona Napanee
Train F3	*Activated sludge treatment plus granular filter*								
Capital cost		$10,599,000	$9,002,000	$9,462,000	$14,327,000	$0	$0	$8,176,000	$5,735,000
O & M cost	$/year	$1,160,000	$1,067,000	$1,076,000	$1,445,000	$0	$0	$1,054,000	$996,000
TSS	kg/day	113	81	88	135	59	5	43	23
BOD	kg/day	79	56	62	94	169	3	30	16
Phosphorus	kg/day	4.5	3.2	3.5	5.4	1.0	0.3	1.7	0.9
Train F4	*Activated sludge treatment plus chemically assisted coagulation*								
Capital cost		$9,694,000	$8,310,000	$8,717,000	$13,279,000	$0	$0	$7,760,000	$5,477,000
O & M costs	$/year	$1,402,000	$1,240,000	$1,266,000	$1,735,000	$0	$0	$1,146,000	$1,046,000
TSS	kg/day	113	81	88	135	59	5	43	23
BOD	kg/day	79	56	62	94	169	3	30	16
Phosphorus	kg/day	4.5	3.2	3.5	5.4	1.0	0.3	1.7	0.9

All effluent data shown above are long term averages

TKN discharges are omitted for trains 3 and 4 due to lack of available data on performance. The values obtained will be somewhat lower than for train 2.

Operating costs, including chemical costs, maintenance costs and the power required for each unit operation, were calculated for each mill using standard base unit costs. Labour costs were taken from Statistics Canada (1990) data on the actual average earnings in the industry plus an allowance of 25% for fringe benefits. It is the opinion of the BAT consultant that the estimates of annual operating costs are better that plus or minus twenty percent of the actual costs.

4.2 ECONOMIC ACHIEVABILITY (EA)

In order to develop effluent limits based on the best available technology economically achievable (BATEA), the Ministry conducted an economic impact assessment of the costs of imposing the identified BAT technology train options on the pulp and paper sector.

The Economic Assessment Subcommittee

An Economic Assessment (EA) Subcommittee was formed under the auspices of the MISA Pulp and Paper Sector Joint Technical Committee to recommend to the JTC the best available technology economically achievable for the MISA pulp and paper sector. The EA subcommittee consisted of representatives from the Ministry, Industry and Environment Canada.

The EA subcommittee was assigned the task of collecting the data necessary to conduct the economic impact assessment and of developing the necessary procedures, methodologies and assumptions to conduct the assessment.

The Economic Impact Assessment

The primary objectives of the economic impact assessment were:

- to evaluate the cost-effectiveness of potential wastewater treatment and abatement program options
- to show the incremental costs of successively higher levels of contaminant removal, and

- to assess the potential financial and economic consequences of the costs associated with potential abatement program options that are cost-effective and other MISA related costs that may be incurred by the regulated plants[2].

Abatement Cost Functions

The cost estimates of the identified BAT technology train options and the contaminant removals associated with each option, were used to devise abatement cost functions, the primary analytical tool used in the economic analysis.

Abatement cost functions show the costs of different technology train option combinations that can be applied to a given mill associated with successively higher levels of contaminant reduction.

Where more than one combination of technologies will achieve the same level of contaminant removal at different costs, the least cost combination of technologies is used in the derivation of the cost functions. Determination of least-cost combinations is a necessary prerequisite to any financial assessment of abatement costs on the regulated mills, firms or sector.

After technically "achievable" least-cost levels of abatement are identified, the next step is to ascertain those technically feasible technology trains that are most cost-effective according to:

- the cost per unit of pollutant removed (the lower the cost per unit of pollutant removed, the more cost effective the option)
- the average incremental cost for each additional unit of pollutant removed in achieving successively higher levels of contaminant reduction in the effluent (the lower the ratio of average incremental cost per incremental unit of pollutant removed, the more cost-effective the option)

The cost effectiveness analysis indicated that the combination of BAT technology train options K2+S1+C1+F1 would be the most cost effective for the pulp and paper sector as a whole. To install this combination, referred to as the Most Cost Effective Control Option, the sector would incur a cost of $580 million in capital costs or $94 million annualized over 10 years and would achieve a 96% reduction in BOD, a 77% reduction in TSS, and a 70% reduction in AOX loadings.

This cost-effective level of abatement was compared with the maximum technically achievable level of control. The combination of BAT technology train options K5+S2+F2+C2 would achieve the highest degree of contaminant removal for the pulp and paper sector as a whole. To install this option, referred to as the Maximum Removal Control Option, the sector would incur a cost of $1.3 billion in capital costs or $181 million annualized over ten years and would achieve a 98% reduction in BOD, an 86% reduction in TSS and an 85% reduction in AOX.

Implications for Competitiveness

The costs associated with the Most Cost Effective Control Option and the MISA effluent monitoring requirements would not displace Eastern Canadian pulp mills from their current position as the third lowest cost producer. However, if the Maximum Removal Control Option costs were incurred, Eastern Canadian market producers would be pushed from their third lowest cost position to the highest cost producer among the regions examined.

For newsprint, neither the Most Cost Effective Control Option or the Maximum Removal Control Option raises total operating costs sufficiently to displace Canadian mills from their position as the second highest cost producers. However, the additional regulatory costs widens the gap that currently exists between Canadian and American producers.

The competitive position of Ontario pulp and paper mills rests largely on the U.S/Canadian dollar exchange rate. In 1989, the value of Ontario shipments to the United States was approximately $2.2 billion dollars. At an exchange rate of $1 Canadian = $0.87 U.S., and assuming shipments remain constant, a 1% depreciation in the U.S/Canada exchange rate would net the Ontario industry approximately $22 million in additional revenue.

The Canadian dollar would have to depreciate by 7% in order for the Ontario pulp and paper industry to accumulate the added funds equal to the proposed annualized costs associated with the Maximum Removal Control Option plus the MISA effluent monitoring requirements. An exchange rate depreciation of only 4% (less than 4 cents) would be necessary to generate the extra revenue equal to the annualized cost of the Most Cost Effective Control Option.

The pulp and paper industry faces a number of other issues which may require capital investment or which may further increase the cost of doing business in Ontario and Canada. These issues include timber management and regeneration, secondary fibre content requirements for newsprint and changing international trade conditions. Any one of these issues, including environmental protection requirements, might not have undue consequences for the industry but, taken together, they present the Ontario and Canadian pulp and paper industry with serious challenges for maintaining competitiveness.

4.3 Best Available Technology Economically Achievable (BATEA)

The results of the economic impact assessment indicate that the combination of technology trains K2+S1+F1+C1 is the Most Cost Effective Control Option for the MISA Pulp and Paper Sector. All of the individual technology trains identified within this option require biological treatment of mill effluent. This requirement forms the basis for the development of the effluent limits.

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2. Ontario Ministry of the Environment (1992). MISA Economic Assessment: Potential Water Pollution Abatement Programs for Ontario Pulp and Paper Mills. Toronto, Ontario.

THE EFFLUENT LIMITS

CHAPTER 5

OF THE

DEVELOPMENT DOCUMENT

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5.1 THE EFFLUENT LIMITS SETTING PROCESS

The approach used for developing effluent limits under the MISA program closely follows the approach used by the U.S. EPA which has withstood numerous court challenges. The statistical procedures recommended for the limits setting process are outlined in the draft Issue Resolution Committee Reports on Monitoring Data Analysis[1]. The extensive database for BAT(EA) plants obtained under the MISA effluent monitoring regulation is used to calculate long-term average performance values and data variability factors which are used to set effluent limits.

The limits setting approach involves the identification of the following:

1. The types of effluent to be limited
2. The form of the effluent limits
3. The candidate parameters to be limited
4. The BAT(EA) plants
5. The method of effluent limits setting

The Types of Effluent to be Limited

Several different types of effluent were monitored under the Effluent Monitoring Regulation for the MISA Pulp and Paper Sector. Process effluent, cooling water effluent, emergency overflow effluent, waste disposal site effluent, backwash effluent and storm water effluent were all monitored under the regulation at various frequencies and for various parameters.

The MISA Effluent Limits Regulation for the Pulp and Paper Sector will limit process effluent since this effluent has the potential to impact the environment and pollutant loadings can be minimized with BAT(EA). Emergency overflow effluent and waste disposal site effluent will also be limited under the Regulation as constituents of process effluent.

Cooling water effluent will not be limited but will be monitored for assessment in order to provide data that can be used, if necessary, to develop suitable control programs that ensure that cooling water is contaminant-free. Cooling water by definition, does not come into contact with process materials and should, therefore, be contaminant-free. Backwash effluent will also not be limited but will be further investigated to determine if control programs are necessary.

Finally, the Effluent Limits Regulation will require all mills with storm water effluent to complete Storm Water Control Studies that identify the location of the storm water effluent streams and outline control measures for each stream.

The Form of Effluent Limits

The form of the effluent limits considers the type of limit and the time frame over which compliance with the limit will be measured. Effluent limits can be expressed as production-based loading limits, loading limits or concentration limits and limits can be set on a daily, weekly or quarterly basis.

Production-based loading limits require that a relationship between production and contaminant loading or flow is established. This ensures that the limits reflect plant operations and do not give unwarranted allowances for discharges solely based on plant size. Concentration limits and loading limits, which are expressed as mass per unit volume and mass per unit time respectively, are based on similar sub-sectors to eliminate sources of diversity. The choice of the type of limit depends on the availability of data and the correlation between variables such as flow, loading and production.

For the MISA Pulp and Paper Sector, mill-specific effluent loading limits have been calculated for each regulated parameter using production-based loading limits to derive the final plant limits. Maximum daily and monthly average loading limits have been calculated for each mill along with daily "not to exceed" concentration limits. The daily limits reflect unavoidable short term fluctuations in mill effluent quality while monthly average loading limits smooth out short term fluctuations and allow more stringent effluent limits to be set.

The Candidate Parameters to be Limited

The candidate parameters that are considered for effluent limits setting are those that can be controlled by the defined BAT(EA). Under special circumstances, parameters like 2,3,7,8-TCDD and 2,3,7,8-TCDF which pose a significant threat to human health and the environment are also limited regardless of BAT(EA).

The MISA White Paper[2] states that limits should be set on a short list of easy-to-measure toxic and conventional parameters. This statement is based on the assumption that compliance with the requirements of the short list will correlate with the control of a longer list of contaminants of concern. For the pulp and paper sector, effluent limits have been developed for ten parameters including the two "special parameters": 2,3,7,8-TCDD and 2,3,7,8-TCDF.

The BAT(EA) Plants

BAT(EA) plant identification and performance data are fundamental to developing the effluent limits. The criteria for identifying BAT(EA) plants is presented in the draft Issue Resolution Committee report on Best Available Technology. In principle, a single BAT(EA) plant is sufficient to provide the information required to calculate numerical effluent limits. The consultant report on Best Available Technology for the Ontario Pulp and Paper Industry identified mills with exemplary secondary effluent treatment which is considered BAT(EA) for the pulp and paper sector as described in Chapter 4. Performance data from these mills have been considered in the development of effluent limits.

The Method of Effluent Limits Setting

The limits setting process consists of the following three methods which can be used to set effluent limits:

- The Linear Method (Production-Based)
- The Average Loading Method
- The Average Concentration Method (Concentration-Based)

The Linear Method was used to calculate production-based limits for the pulp and paper sector. In the Linear Method, limits are expressed as a function of concentration and flow per unit of production, where concentration and flow are numerical factors determined from the BAT(EA) plants. The result is a production-based limit which is expressed in terms of kilograms of contaminant per tonne of product and, therefore, takes plant size into consideration. The fact that the flow per unit of production from the BAT(EA) plants is used as a factor in the derivation of the limits imposes a restriction on effluent flow.

The Linear Method facilitates the calculation of mill-specific effluent loading limits expressed in terms of kilograms of contaminant per day. These limits are derived by multiplying the Linear Method production-based limits by mill reference production rates.

The steps used to derive the effluent limits for each parameter are outlined below:

Step 1 **Calculate the average-production-based flowrate**

Calculate the flow per unit of production where flow and production are average values from the BAT(EA) plants.

Step 2 **Calculate the average LTA concentration**

Calculate the average LTA concentration for the parameter to be limited based on the data from the BAT(EA) plants. The value is calculated as the arithmetic average of the LTA concentration data from the BAT(EA) plants.

Step 3 **Calculate the average concentration variability factor**

Calculate the average concentration variability factor for the parameter to be limited based on the data from the BAT(EA) plants. The value is calculated as the arithmetic average of the variability factors from the BAT(EA) plants.

Step 4 **Calculate the BAT(EA) performance value**

The product of the average LTA concentration, average variability factor and average production-based flowrate is the basis for the final parameter limit which is calculated by multiplying the production-based limit performance value times the mill reference production rate.

The Average Loading Method was not used in the effluent limits setting exercise because of several concerns with the accuracy of the flow measurement data for one of the BAT(EA) plants. The Average Concentration Method was not used to calculate effluent limits because production and flow vary significantly from mill to mill.

The Effluent Limits Setting (ELS) Subcommittee

In order to review the development of the effluent limits for the pulp and paper sector, an Effluent Limits Setting Subcommittee (ELSS) was formed under the MISA Pulp and Paper Sector Joint Technical Committee. The subcommittee consisted of representatives from the Ministry, Industry and Environment Canada.

The main objective of the effluent limits setting subcommittee was to recommend to the Joint Technical Committee a set of numerical effluent limits for the MISA pulp and paper sector. Appropriate input and technical support was provided by the Best Available Technology (BAT) subcommittee, Effluent Monitoring Data Evaluation (EMDE) subcommittee and Economic Assessment (EA) subcommittee.

5.2 THE CANDIDATE PARAMETER LIST

Candidate Parameter Selection

The candidate parameter list was established according to the general steps described in the draft Issue Resolution Committee Reports on Limits Setting and Data Analysis. The following steps were followed:

- The effluent monitoring data were analyzed in order to determine the parameters which were statistically present in the effluent.
- Parameters identified as being statistically present in the effluent were analyzed using rigorous Quality Assurance/Quality Control (QA/QC) data assessment procedures.
- The identified BAT technology train options were assessed as to their ability to treat the parameters remaining after the QA/QC data assessment.

- "Special parameters", that pose a significant threat to human health and the environment, were assessed in order to determine if they should be added to the candidate parameter list.

Based on the candidate parameter selection criteria outlined in Chapter 3 of the Development Document and following QA/QC data assessment, 57 parameters were identified as candidate parameters for effluent limits setting for the sulphate (kraft) category, 33 for the sulphite-mechanical category, 37 for the corrugating category and 45 for the deinking/board/fine papers/tissue category.

Table 5.1 presents the combined list of candidate parameters for all four categories following candidate parameter selection and QA/QC data assessment.

Candidate Parameter Screening

The candidate parameters on the candidate parameter list was reviewed in order to assess their suitability for use in the effluent limits setting process. Each parameter was reviewed in order to determine:

- what the parameter actually measures, its environmental significance and its presence in mill effluent

- the quality of the effluent monitoring data based on the QA/QC data assessment and its suitability for use in the setting of effluent limits

- whether the parameter can be controlled using the identified best available technology and the predicted removal efficiencies for those parameters that can be controlled.

- whether sufficient BAT performance data exists to support the setting of effluent limits

While some parameters can be controlled to predictable, quantifiable levels, others can only be controlled to qualitative levels. For the purposes of effluent limits setting, only parameters that can be controlled to predictable, quantifiable levels can be considered.

Table 5.1
The Candidate Parameter List Following QA/QC Data Assessment

ATG	Parameter	Category			
1	Chemical Oxygen Demand (COD)	K	M	C	D
4a	Ammonia plus Ammonium	K	M	C	D
	Total Kjeldahl Nitrogen	K	M	C	D
4b	Nitrate + Nitrite	K	M	C	D
5a	Dissolved Organic Carbon (DOC)	K	M	C	D
6	Total Phosphorus	K	M	C	D
7	Specific Conductance	K	M	C	D
8	Total Suspended Solids (TSS)	K	M	C	D
	Volatile Suspended Solids (VSS)	K	M	C	D
9	Aluminum	K	M	C	D
	Cadmium			C	
	Chromium	K		C	D
	Cobalt			C	
	Copper	K	M	C	D
	Lead			C	
	Molybdenum			C	
	Nickel	K		C	
	Thallium			C	
	Zinc	K	M	C	D
12	Mercury	K			
15	Sulphide	K			
16	1,1-Dichloroethane				D
	1,1-Dichloroethylene				D
	Bromodichloromethane	K			D
	Chloroform	K	M	C	D
	Chloromethane		M		
	Dibromochloromethane				D
	Tetrachloroethylene				D
	Trichloroethylene				D

Table 5.1 (cont'd) The Candidate Parameter List Following QA/QC Data Assessment

ATG	Parameter	Category			
17	Benzene	K	M		D
	Styrene	K	M		
	Toluene	K	M		D
	m-Xylene and p-Xylene				D
	o-Xylene		M		D
19	2-Methylnaphthalene				D
	Acenaphthalene	K			
	Camphene	K	M		
	Chrysene	K			
	Fluoranthene	K			
	Naphthalene	K			D
	Phenanthrene	K			
	Pyrene	K			
20	2,4,6-Trichlorophenol	K			
	2,4-Dichlorophenol	K			
	Pentachlorophenol				D
	Phenol	K	M	C	D
	m-Cresol	K	M		D
	o-Cresol	K		C	
	p-Cresol	K	M		D
23	1,2,3,4-Tetrachlorobenzene				D
	1,2,3-Trichlorobenzene				D
	1,2,4-Trichlorobenzene	K			D
	2,4,5-Trichlorotoluene	K			

Table 5.1 (cont'd)
The Candidate Parameter List Following QA/QC Data Assessment

ATG	Parameter	Category			
24	2,3,7,8-TCDD	K			
	Total TCDD	K			
	Total TCDF	K		C	D
	Total PCDD	K			
	Total PCDF	K			
	Total H6CDD	K		C	
	Total H6CDF	K			
	Total H7CDD	K		C	
	Total H7CDF			C	
	Octachlorodibenzo-p-dioxin	K	M	C	D
	Octachlorodibenzofuran	K	M	C	
26	Abietic Acid	K	M	C	D
	Chlorodehydroabietic Acid	K	M	C	D
	Dehydroabietic Acid	K	M	C	D
	Dichlorodehydroabietic Acid	K			
	Isopimaric Acid	K	M	C	D
	Levopimaric Acid	K	M	C	D
	Neoabietic Acid	K	M	C	D
	Oleic Acid	K	M	C	D
	Pimaric Acid	K	M	C	D
M8	BOD, 5 day, Total Demand	K	M	C	D
M13	Adsorbable Organic Halide (AOX)	K			D

Legend
K = Sulphate (Kraft) Category
M = Sulphite-Mechanical Category
C = Corrugating Category
D = Deinking/Board/Fine Papers/Tissue Category

Each candidate parameter was reviewed in light of the above criteria and the following parameters were removed from further consideration in the effluent limits setting process for the reasons indicated:

ATG 1: Chemical Oxygen Demand (COD)

Chemical Oxygen Demand (COD) measures the amount of oxygen consumed in an effluent sample based on the rapid chemical oxidation of the sample. While internal mill measures are more efficient at reducing COD, approximately 40% of the COD in mill effluent can be removed with biological effluent treatment. COD was selected as a candidate parameter for the eighteen mills that monitored for it. Because of the mill-specific and process-specific nature of COD and due to the lack of BAT(EA) treatability data, COD was not considered further for effluent limits setting.

ATG 5a: Dissolved Organic Carbon (DOC)

Dissolved organic carbon (DOC) measures the carbon content of the organic materials which are present in solution in the effluent. DOC was selected as a candidate parameter for all nine mills that monitored for it. Because of the lack of BAT(EA) treatability data, DOC was not considered further for effluent limits setting.

ATG 7: Specific Conductance

Specific conductance is a measure of the ability of water to carry an electric current and is used as an indicator of the salt content in the water, changes in effluent composition and the frequency of plant spills and upsets. It is thus used for best management practices within the mill. Effluents with low conductivity tend to be less corrosive than effluents with high conductivity and thus more amenable to recycling. Specific conductance was selected as a candidate parameter for all twenty-seven mills because the RMDL is 5 μS/cm and normal potable water has a specific conductance in the range of 100 to 300 μS/cm. Because of the mill-specific and process specific nature of specific conductance and due to the lack of BAT(EA) treatability data, specific conductance was not considered further for effluent limits setting.

ATG 8: Volatile Suspended Solids (VSS)

Volatile suspended solids (VSS) is a further characterization of total suspended solids (TSS) in which combustible organic content is determined. VSS was selected as a candidate parameter for the eight mills with biological treatment systems that were required to monitor for it. VSS was not considered for effluent limits setting because it is more practical to limit TSS which also controls VSS.

ATG 9: Aluminum

Aluminum, though present naturally in aquatic ecosystems, is added during the papermaking process in the form of alum as a sizing agent and as an aid for pitch and pH control. Alum is also added to biological treatment systems to precipitate suspended solids and phosphorus during effluent treatment. The form of aluminum ions in water is influenced by pH and DOC and the nature of these ions in the effluent will affect effluent toxicity. Aluminum was selected as a candidate parameter for all twenty-seven mills. The average concentration of aluminum in process effluent ranged from 49.13 μg/L to 6,104.31 μg/L which are respectively 1.64 and 203.48 times the RMDL of 30 μg/L. Since BAT(EA) technology is not available to predict aluminum removal efficiencies when designing effluent treatment systems for the relatively low concentrations found in mill effluents, aluminum was not considered further for effluent limits setting.

ATG 9: Cadmium

Cadmium was selected as a candidate parameter for Domtar (Trenton) and MacMillan-Bloedel; however, the data for MacMillan-Bloedel are considered unreliable for effluent limits setting. The average concentration of cadmium in the process effluent from Domtar (Trenton) was 3.5 μg/L which is 1.75 times the RMDL of 2 μg/L. Based on the limited occurrence of this parameter and the low level of the reported data, cadmium was not considered further for effluent limits setting.

ATG 9: Chromium

Chromium is a known constituent of wood and was selected as a candidate parameter for three sulphate (kraft) mills, the two corrugating mills including MacMillan-Bloedel, and one deinking/board/fine papers/tissue mill (Trent Valley). The data for MacMillan-Bloedel are considered unreliable for effluent limits setting. The average concentration of chromium in process effluent ranged from 21.67 μg/L to 148.33 μg/L which is 0.72 and 7.42 times the RMDL of 30 μg/L. Since BAT(EA) is not available to predict chromium removal efficiencies when designing effluent treatment systems for the relatively low concentrations found in mill effluent, chromium was not considered further for effluent limits setting.

ATG 9: Cobalt

Cobalt was selected as a candidate parameter for MacMillan-Bloedel (both process effluent streams) but the data are considered unreliable for effluent limits setting. Based on the unique occurrence of this parameter and the unreliable quality of the effluent monitoring data, cobalt was not considered further for effluent limits setting.

ATG 9: Copper

Copper is a known constituent of wood. Copper salts are generally used in wood preservatives, fungicides and antifouling agents and are common in raw water supplies. Copper was selected as a candidate parameter for twenty-one mills but the data for MacMillan-Bloedel and Beaver Wood are considered unreliable for effluent limits setting. The average concentration of copper in process effluent ranged from 8.33 μg/L to 51.86 μg/L which are respectively 0.83 and 5.19 times the RMDL of 10 μg/L. Since BAT(EA) treatability data are not available to predict copper removal efficiencies when designing effluent treatment systems for the relatively low concentrations found in mill effluent, copper was not considered further for effluent limits setting.

ATG 9: Lead

Lead and lead compounds are not used in pulp and paper operations. It can be postulated that lead originates from its presence in trees and, to a lesser extent, from corrosion or erosion of equipment in the mill (ie. lead-based solder). Lead was selected as a candidate parameter for MacMillan-Bloedel (both process effluent streams) but the data are considered unreliable for effluent limits setting. Based on the unique occurrence of this parameter and the unreliable quality of the effluent monitoring data, lead was not considered further for effluent limits setting.

ATG 9: Molybdenum

Molybdenum was selected as a candidate parameter for MacMillan-Bloedel (control point 0200) but the data are considered unreliable for effluent limits setting. Based on the unique occurrence of this parameter and the unreliable quality of the data, molybdenum was not considered further for effluent limits setting.

ATG 9: Nickel

Nickel was selected as a candidate parameter for E.B. Eddy (Espanola), James River-Marathon, Kimberly-Clark (Terrace Bay) and MacMillan-Bloedel (control point 0200); however, the data for MacMillan-Bloedel are considered unreliable for effluent limits setting. The average concentration of nickel in process effluent ranged from 13.33 μg/L to 31.36 μg/L which are respectively 0.67 and 1.57 times the RMDL of 20 μg/L. Based on the limited occurrence of this parameter and the low level of the reported data, nickel was not considered further for effluent limits setting.

ATG 9: Thallium

Thallium was selected as a candidate parameter for MacMillan-Bloedel (both process effluent streams) but the data are considered unreliable for effluent limits setting. Based on the unique occurrence of this parameter and the unreliable quality of the effluent monitoring data, thallium was not considered further for effluent limits setting.

ATG 9: Zinc

Zinc is not used as a raw material by any of the mills in Ontario but is present in wood. Zinc was selected as a candidate parameter for all mills; however, the data for MacMillan-Bloedel, Beaver Wood, Domtar (St. Catharines) and Strathcona are considered unreliable for effluent limits setting and the data for Spruce Falls are considered of limited quality. The average concentration of zinc in process effluent ranged from 15.65 μg/L to 815.27 μg/L which are respectively 1.57 and 81.53 times the RMDL of 10 μg/L. Since BAT(EA) treatability data are not available to predict zinc removal efficiencies when designing effluent treatment systems for the relatively low concentrations found in mill effluent, zinc was not considered further for effluent limits setting.

ATG 12: Mercury

Previously, phenyl-mercury acetate was used for control of fungi in the pulp and paper industry. Presently, however, mercury likely originates from the trees used to produce pulp, since growing trees accumulate mercury when exposed to it. Mercury is still used in older chlor-alkali plants and may be carried to the bleach plants with the chlorine gas or caustic soda if these bleaching chemicals were produced using this process. Mercury was selected as a candidate parameter for James River-Marathon. The average concentration of mercury in the process effluent from James River-Marathon was 0.49 μg/L which is 4.9 times the RMDL of 0.1 μg/L. Based on the unique occurrence of this parameter and since it is on the proposed Candidate Substances List for Bans or Phase-outs, mercury was not considered further for effluent limits setting.

ATG 15: Sulphide

Sulphide is present in kraft mill cooking liquors and condensates and is very toxic to aerobic life such as fish and crustaceans. Sulphide was selected as a candidate parameter for the nine sulphate (kraft) mills that were required to monitor for it. Since sulphide is easily oxidized to sulphate under aerobic conditions and since the effluent limits are based on the installation of biological effluent treatment, sulphide was not considered further for effluent limits setting.

ATG 16: 1,1-Dichloroethane

1,1-Dichloroethane was selected as a candidate parameter for Trent Valley and Kimberly-Clark (St. Catharines); however, the data from Trent Valley are considered unreliable for effluent limits setting. The average concentration of 1,1-dichloroethane in the process effluent from Kimberly-Clark (St. Catharines) was 0.92 μg/L which is 1.15 times the RMDL of 0.8 μg/L. Based on the limited occurrence of this parameter and the low level of the reported data, 1,1-dichloroethane was not considered further for effluent limits setting.

ATG 16: 1,1-Dichloroethylene

1,1-Dichloroethylene was selected as a candidate parameter for Beaver Wood and Trent Valley; however, the data from Beaver Wood are considered unreliable for effluent limits setting. The average concentration of 1,1-dichloroethylene in the process effluent from Trent Valley was 12.85 μg/L which is 4.59 times the RMDL of 2.8 μg/L. Based on the limited occurrence of this parameter and the lack of BAT(EA) treatability data, 1,1-dichloroethylene was not considered further for effluent limits setting.

ATG 16: Bromodichloromethane

Bromodichloromethane may be formed when trace amounts of bromine are present in the chlorine gas used for pulp bleaching. Bromodichloromethane was selected as a candidate parameter for Domtar (Cornwall) and Noranda Forest; however, since the mechanism of generation is similar to that of chloroform and since the data for chloroform are more reliable, chloroform was considered for effluent limits setting instead.

ATG 16: Chloromethane

Chloromethane was selected as a candidate parameter for St. Marys Paper but the data are considered of limited quality for effluent limits setting. The average concentration of chloromethane in the process effluent from St. Marys Paper was 3.84 $\mu g/L$ which is 1.04 times the RMDL of 3.7 $\mu g/L$. Based on the unique occurrence of this parameter and the limited quality and low level of the reported data, chloromethane was not considered further for effluent limits setting.

ATG 16: Dibromochloromethane

Dibromochloromethane was selected as a candidate parameter for Noranda Forest. The average concentration of dibromochloromethane in the process effluent from Noranda Forest was 1.29 $\mu g/L$ which is 1.17 times the RMDL of 1.1 $\mu g/L$. Based on the unique occurrence of this parameter and the low level of the reported data, dibromochloromethane was not considered further for effluent limits setting.

ATG 16: Tetrachloroethylene

Tetrachloroethylene was selected as a candidate parameter for Kimberly-Clark (St. Catharines). The average concentration of tetrachloroethylene in the process effluent from Kimberly-Clark (St. Catharines) was 1.6 $\mu g/L$ which is 1.46 times the RMDL of 1.1 $\mu g/L$. Based on the unique occurrence of this parameter and the low level of the reported data, tetrachloroethylene was not considered further for effluent limits setting.

ATG 16: Trichloroethylene

Trichloroethylene was selected as a candidate parameter for Kimberly-Clark (St. Catharines). The average concentration of trichloroethylene in the process effluent from Kimberly-Clark (St. Catharines) was 5.4 $\mu g/L$ which is 2.84 times the RMDL of 1.9 $\mu g/L$. Based on the unique occurrence of this parameter and the lack of BAT(EA) treatability data, trichloroethylene was not considered further for effluent limits setting.

ATG 17: Benzene

Benzene is not normally associated with pulp and paper operations and may originate from gasoline and light crude oil sources. Benzene is partly degradable in and/or stripped in biological treatment systems, but is better controlled by best management practices. Benzene was selected as a candidate parameter for three sulphate (kraft) mills, four sulphite-mechanical mills and four deinking/board/fine papers/tissue mills; however, the data for Abitibi-Price (Iroquois Falls Division), Abitibi-Price (Thunder Bay Division), Beaver Wood, Noranda Forest and St. Marys Paper are considered unreliable for effluent limits setting and the data for Abitibi-Price (Provincial Papers Division) are considered of limited quality. The average concentration of benzene in process effluent ranged from 0.93 $\mu g/L$ to 10.47 $\mu g/L$ which are respectively 1.86 and 20.94 times the RMDL of 0.5 $\mu g/L$. As the data for toluene are more reliable and the sources of generation are similar, toluene was considered for effluent limits setting instead.

ATG 17: Styrene

Styrene is not normally associated with pulp and paper operations and may originate from gasoline and light crude oil sources. Styrene is partly degradable in and/or stripped in biological treatment systems, but is better controlled by best management practices. Styrene was selected as a candidate parameter for Domtar (Cornwall), Malette and Abitibi-Price (Provincial Papers Division); however, the data for Malette are considered unreliable for effluent limits setting. The average concentrations of styrene in the process effluents from Abitibi-Price (Provincial Papers Division) and Domtar (Cornwall) were 1.26 $\mu g/L$ and 4.12 $\mu g/L$ which are respectively 2.52 and 8.24 times the RMDL of 0.5 $\mu g/L$. As the data for toluene are more reliable and the sources of generation are similar, toluene was considered for effluent limits setting instead.

ATG 17: m-Xylene and p-Xylene

m-Xylene and p-xylene originate from gasoline and light crude oil sources and are sometimes used as a cleaning solvent. They are partly degradable in and/or stripped in biological treatment systems but are better controlled by minimizing petrochemical spills. m-Xylene and p-xylene were selected as a candidate parameter for Beaver Wood and Noranda Forest; however, the data for Beaver Wood are of unreliable quality for effluent limits setting. The average concentration of m-xylene and p-xylene in the process effluent from Noranda Forest was 1.84 μg/L which is 1.67 times the RMDL of 1.1 μg/L. Based on the limited occurrence of this parameter and the low level of the reported data, m-xylene and p-xylene were not considered further for effluent limits setting.

ATG 17: o-Xylene

o-Xylene originates from gasoline and light crude oil sources and is sometimes used as a cleaning solvent. It is partly degradable in and/or stripped in biological treatment systems but is better controlled by minimizing petrochemical spills. o-Xylene was selected as a candidate parameter for Beaver Wood, Noranda Forest, Abitibi-Price (Provincial Papers Division) and Abitibi-Price (Fort William Division - 0200). The average concentrations of o-xylene in the process effluents from Beaver Wood and Abitibi-Price (Fort William - 0200) were 0.43 μg/L and 0.45 μg/L which are less than the RMDL of 0.5 μg/L. The average concentrations of o-xylene in the process effluents from Noranda Forest and Abitibi-Price (Provincial Papers Division) were 1.33 μg/L and 2.2 μg/L which are respectively 2.7 and 4.4 times the RMDL of 0.5 μg/L. Based on the limited occurrence of this parameter and the low levels of the reported data, o-xylene was not considered further for effluent limits setting.

ATG 19: 2-Methylnaphthalene

2-Methylnaphthalene was selected as a candidate parameter for Kimberly-Clark (St. Catharines). The average concentration of 2-methylnaphthalene in the process effluent from Kimberly-Clark (St. Catharines) was 3.69 μg/L which is 1.68 times the RMDL of 2.2 μg/L. Based on the unique occurrence of this parameter and the low level of the reported data, 2-methylnaphthalene was not considered further for effluent limits setting.

ATG 19: Acenaphthalene

Acenaphthalene was selected as a candidate parameter for Domtar (Cornwall). The average concentration of acenaphthalene in the process effluent from Domtar (Cornwall) was 4.52 μg/L which is 3.23 times the RMDL of 1.4 μg/L. Based on the unique occurrence of this parameter and the lack of BAT(EA) treatability data, acenaphthalene was not considered further for effluent limits setting.

ATG 19: Camphene

Camphene is normally found in wood extractives and is quite persistent even after biological treatment. Camphene was selected as a candidate parameter for three mills in the sulphate (kraft) category and two mills in the sulphite-mechanical category. The average concentration of camphene in process effluent ranged from 2.39 μg/L to 15.09 μg/L which are respectively 0.68 and 4.31 times the RMDL of 3.5 μg/L. Based on the limited occurrence of this parameter, the relatively low levels of the reported data and the lack of BAT(EA) treatability data, camphene was not considered further for effluent limits setting.

ATG 19: Chrysene

Chrysene was selected as a candidate parameter for Domtar (Cornwall). The average concentration in the process effluent from Domtar (Cornwall) was 1.45 μg/L which is 4.83 times the RMDL of 0.3 μg/L. Based on the unique occurrence of this parameter and the lack of BAT(EA) treatability data, chrysene was not considered further for effluent limits setting.

ATG 19: Fluoranthene

Fluoranthene was selected as a candidate parameter for Domtar (Cornwall). The average concentration in the process effluent from Domtar (Cornwall) was 4.99 μg/L which is 12.47 times the RMDL of 0.4 μg/L. Based on the unique occurrence of this parameter and the lack of BAT(EA) treatability data, fluoranthene was not considered further for effluent limits setting.

ATG 19: Naphthalene

Naphthalene was selected as a candidate parameter for one mill in the sulphate (kraft) category and three mills in the deinking/board/fine papers/tissue category. The average concentration in process effluent ranged from 1.05 μg/L to 7.78 μg/L which are respectively 0.66 and 4.86 times the RMDL of 1.6 μg/L. Naphthalene has a tendency to adsorb onto suspended solids and biota and will be controlled setting a limit on total suspended solids. Based on the limited occurrence of this parameter and the lack of BAT(EA) treatability data, naphthalene was not considered further for effluent limits setting.

ATG 19: Phenanthrene

Phenanthrene was selected as a candidate parameter for Domtar (Cornwall). The average concentration of phenanthrene in the process effluent from Domtar (Cornwall) was 11.83 μg/L which is 29.58 times the RMDL of 0.4 μg/L. Based on the unique occurrence of this parameter and since this parameter is on the proposed Candidate Substances List for Bans or Phase-outs, phenanthrene was not considered further for effluent limits setting.

ATG 19: Pyrene

Pyrene was selected as a candidate parameter for Domtar (Cornwall). The average concentration of pyrene in the process effluent from Domtar (Cornwall) was 3.01 μg/L which is 7.53 times the RMDL of 0.4 μg/L. Based on the unique occurrence of this parameter and the lack of BAT(EA) treatability data, pyrene was not considered further for effluent limits setting.

ATG 20: 2,4,6-Trichlorophenol

2,4,6-Trichlorophenol is generated during chlorine bleaching and is washed out during caustic extraction. 2,4,6-Trichlorophenol is more persistent than 2,4-dichlorophenol and is eliminated by using oxygen delignification and by reducing the amount of chlorine used in bleaching. It is also reduced by biological effluent treatment, possibly by sedimentation. 2,4,6-Trichlorophenol was selected as a candidate parameter for six mills but was not considered further for effluent limits setting due to the lack of BAT(EA) treatability data and because it is more practical to limit the discharge of AOX which will decrease the formation of the most toxic chlorinated phenols.

ATG 20: 2,4-Dichlorophenol

2,4-Dichlorophenol originates during chlorine bleaching and is washed out during caustic extraction. 2,4-Dichlorophenol is reduced in biological effluent treatment and is readily biodegraded in the environment. Dichlorophenols have a tendency to accumulate on particulate materials and, therefore, sedimentation may be the primary method of removal in aquatic environments. 2,4-Dichlorophenol was selected as a candidate parameter for five mills but was not considered further for effluent limits setting because the formation of dichlorophenols increases when the amount of chlorine used for bleaching decreases. Like 2,4,6-trichlorophenol, it is more practical to limit the discharge of AOX which will decrease the formation of the most toxic chlorinated phenols.

ATG 20: Pentachlorophenol

Pentachlorophenol was selected as a candidate parameter for Trent Valley. The average concentration of pentachlorophenol in the process effluent from Trent Valley was 0.93 μg/L which is 0.71 times the RMDL of 1.3 μg/L. Based on the unique occurrence of this parameter and the low level of the reported data, pentachlorophenol was not considered further for effluent limits setting.

ATG 23: 1,2,3,4-Tetrachlorobenzene

1,2,3,4-Tetrachlorobenzene was selected as a candidate parameter for E.B. Eddy (Ottawa). The average concentration of 1,2,3,4-tetrachlorobenzene in the process effluent from E.B. Eddy (Ottawa) was 0.01 μg/L which is equal to the RMDL. Based on the unique occurrence of this parameter and the low level of the reported data, 1,2,3,4-tetrachlorobenzene was not considered further for effluent limits setting.

ATG 23: 1,2,3-Trichlorobenzene

1,2,3-Trichlorobenzene was selected as a candidate parameter for E.B. Eddy (Ottawa). The average concentration of 1,2,3-trichlorobenzene in the process effluent from E.B. Eddy (Ottawa) was 0.01 μg/L which is equal to the RMDL. Based on the unique occurrence of this parameter and the low level of the reported data, 1,2,3-trichlorobenzene was not considered further for effluent limits setting.

ATG 23: 1,2,4-Trichlorobenzene

1,2,4-Trichlorobenzene was selected as a candidate parameter for E.B. Eddy (Ottawa) and Malette; however, the data from both mills were considered of limited quality for effluent limits setting. The average concentrations of 1,2,4-trichlorobenzene in the process effluents from E.B. Eddy (Ottawa) and Malette were 0.02 μg/L and 0.01 μg/L which are respectively 2 and 1 times the RMDL of 0.01 μg/L. Based on the limited occurrence of this parameter, the limited quality and low levels of the reported data, 1,2,4-trichlorobenzene was not considered further for effluent limits setting.

ATG 23: 2,4,5-Trichlorotoluene

2,4,5-Trichlorotoluene was selected as a candidate parameter for Malette but the data are considered unreliable for effluent limits setting. Based on the unique occurrence of this parameter and the unreliable quality of the effluent monitoring data, 2,4,5-trichlorotoluene was not considered further for effluent limits setting.

ATG 24: Total Tetrachlorodibenzo-p-dioxin (TCDD)

Total TCDD was selected as a candidate parameter for James River-Marathon and Kimberly-Clark (Terrace Bay). The average concentrations of total TCDD in the process effluents from James River-Marathon and Kimberly-Clark (Terrace Bay) were 0.04 ng/L and 0.32 ng/L which are respectively 2 and 16 times the RMDL of 0.02 ng/L. Based on the limited occurrence of this parameter and the lack of BAT(EA) treatability data, total TCDD was not considered further for effluent limits setting.

ATG 24: Total Tetrachlorodibenzofuran (TCDF)

Total TCDF was selected as a candidate parameter for eight sulphate (kraft) mills including Malette, one corrugating mill and one deinking/board/fine papers/tissue mill but the data for Malette are considered unreliable for effluent limits setting. The average concentration of total TCDF in process effluent ranged from 0.02 ng/L to 0.32 ng/L which are respectively 1.3 and 21.3 times the RMDL of 0.015 ng/L. Based on the lack of BAT(EA) treatability data, total TCDF was not considered further for effluent limits setting.

ATG 24: Total Pentachlorodibenzo-p-dioxin (PCDD)

Total PCDD was selected as a candidate parameter for James River-Marathon and Kimberly-Clark (Terrace Bay). The average concentrations of total PCDD in the process effluents from James River-Marathon and Kimberly-Clark (Terrace Bay) were 0.03 ng/L and 0.04 ng/L which are respectively 1.5 and 2 times the RMDL of 0.02 ng/L. Based on the limited occurrence of this parameter and the lack of BAT(EA) treatability data, total PCDD was not considered further for effluent limits setting.

ATG 24: Total Pentachlorodibenzofuran (PCDF)

Total PCDF was selected as a candidate parameter for James River-Marathon and Kimberly-Clark (Terrace Bay). The average concentrations of total PCDF in the process effluents from James River-Marathon and Kimberly-Clark (Terrace Bay) were 0.17 ng/L and 0.04 ng/L which are respectively 11.3 and 2.7 times the RMDL of 0.015 ng/L. Based on the limited occurrence of this parameter and the lack of BAT(EA) treatability data, total PCDF was not considered further for effluent limits setting.

ATG 24: Total Hexachlorodibenzo-p-dioxin (H6CDD)

Total H6CDD was selected as a candidate parameter for Kimberly-Clark (Terrace Bay) and Domtar (Trenton). The average concentrations of total H6CDD in the process effluents from Kimberly-Clark (Terrace Bay) and Domtar (Trenton) were 0.05 ng/L to 0.30 ng/L which are respectively 1.7 and 10 times the RMDL of 0.03 ng/L. Based on the limited occurrence of this parameter and the lack of BAT(EA) treatability data, total H6CDD was not considered further for effluent limits setting.

ATG 24: Total Hexachlorodibenzofuran (H6CDF)

Total H6CDF was selected as a candidate parameter for James River-Marathon. The average concentration of total H6CDF in the process effluent from James River-Marathon was 0.05 ng/L which is 2.5 times the RMDL of 0.02 ng/L. Based on the unique occurrence of this parameter and the lack of BAT(EA) treatability data, total H6CDF was not considered further for effluent limits setting.

ATG 24: Total Heptachlorodibenzo-p-dioxin (H7CDD)

Total H7CDD was selected as a candidate parameter for James River-Marathon and Domtar (Trenton); however, the data for James River-Marathon are considered of limited quality for effluent limits setting. The average concentrations of total H7CDD in the process effluents from James River-Marathon and Domtar (Trenton) were 0.11 ng/L and 1.1 ng/L which are respectively 3.7 and 36.7 times the RMDL of 0.03 ng/L. Based on the limited occurrence of this parameter and the lack of BAT(EA) treatability data, total H7CDD was not considered further for effluent limits setting.

ATG 24: Total Heptachlorodibenzofuran (H7CDF)

Total H7CDF was selected as a candidate parameter for Domtar (Trenton). The average concentration of total H7CDF in the process effluent from Domtar (Trenton) was 0.32 ng/L which is 10.7 times the RMDL of 0.03 ng/L. Based on the unique occurrence of this parameter and the lack of BAT(EA) treatability data, total H7CDF was not considered further for effluent limits setting.

ATG 24: Octachlorodibenzo-p-dioxin

Octachlorodibenzo-p-dioxin was selected as a candidate parameter for six sulphate (kraft) mills, six sulphite-mechanical mills including Abitibi-Price (Thunder Bay Division), one corrugating mill and three deinking/board/fine papers/tissue mills including Kimberly-Clark (Huntsville); however, the data for Abitibi-Price (Thunder Bay Division) and Kimberly-Clark (Huntsville) are considered unreliable for effluent limits setting. The average concentration of octachlorodibenzo-p-dioxin in process effluent ranged from 0.03 ng/L to 10.9 ng/L which are respectively 1 and 363 times the RMDL of 0.03 ng/L. Based on the lack of BAT(EA) treatability data, octachlorodibenzo-p-dioxin was not considered further for effluent limits setting.

ATG 24: Octachlorodibenzofuran

Octachlorodibenzofuran was selected as a candidate parameter for James River-Marathon, Kimberly-Clark (Terrace Bay), Abitibi-Price (Iroquois Falls Division) and Domtar (Trenton). The average concentration of octachlorodibenzofuran in process effluent ranged from 0.05 ng/L to 0.8 ng/L which are respectively 1.7 and 26.7 times the RMDL of 0.03 ng/L. Based on the limited occurrence of this parameter and the lack of BAT(EA) treatability data, octachlorodibenzofuran was not considered further for effluent limits setting.

ATG 26: Abietic Acid

Abietic acid is a naturally-occurring compound in wood resin that is released during the pulping of wood and is toxic to fish. Biological treatment of pulp and paper effluent has generally demonstrated 60 to 90% removal of abietic acid with average removal closer to 90%. Abietic acid was selected as a candidate parameter for twenty-two mills but was not considered further for effluent limits setting because predictable treatment removal efficiencies could not be determined.

ATG 26: Chlorodehydroabietic Acid

Chlorodehydroabietic acid was selected as a candidate parameter for thirteen mills but was not considered further for effluent limits setting because predictable treatment removal efficiencies could not be determined.

ATG 26: Dehydroabietic Acid

Dehydroabietic acid was selected as a candidate parameter for twenty-six mills but was not considered further for effluent limits setting because predictable treatment removal efficiencies could not be determined.

ATG 26: Dichlorodehydroabietic Acid

Dichlorodehydroabietic acid is a chlorinated resin and fatty acid that is controlled by either reducing black liquor carry-over to the bleach plant and/or reducing the amount of chlorine used in pulp bleaching. Dichlorodehydroabietic acid is slow to degrade in the aquatic environment and was selected as a candidate parameter for the eight mills that monitored for it but was not considered further for effluent limits setting because predictable treatment removal efficiencies could not be determined.

ATG 26: Isopimaric Acid

Isopimaric acid was selected as a candidate parameter for twenty mills but was not considered further for effluent limits setting because predictable treatment removal efficiencies could not be determined.

ATG 26: Levopimaric Acid

Levopimaric acid was selected as a candidate parameter for fifteen mills but was not considered further for effluent limits setting because predictable treatment removal efficiencies could not be determined.

ATG 26: Neoabietic Acid

Neoabietic acid was selected as a candidate parameter for sixteen mills but was not considered further for effluent limits setting because predictable treatment removal efficiencies could not be determined.

ATG 26: Oleic Acid

Oleic acid was selected as a candidate parameter for nineteen mills but was not considered further for effluent limits setting because predictable treatment removal efficiencies could not be determined.

ATG 26: Pimaric Acid

Pimaric acid was selected as a candidate parameter for twenty-two mills but was not considered further for effluent limits setting because predictable treatment removal efficiencies could not be determined.

The Final Candidate Parameters List

Based on the technical review of each parameter on the candidate parameter list, a shorter list of candidate parameters was developed for which effluent limits can be set. This list, referred to as the Final Candidate Parameter List, is presented in Table 5.2.

2,3,7,8-TCDD and 2,3,7,8-TCDF have been included on the Final Candidate Parameter List because of the significant threat they pose to human health and the environment. Chlorinated dioxins and furans, especially 2,3,7,8-TCDD were defined by the International Joint Commission (IJC) as being critical, bioaccumulative persistent toxic substances.

Table 5.2
The Final Candidate Parameter List

ATG	Parameter	Category			
4a	Ammonia plus Ammonium	K	M	C	D
6	Total Phosphorus	K	M	C	D
8	Total Suspended Solids (TSS)	K	M	C	D
16	Chloroform	K	M	C	D
17	Toluene	K	M		D
20	Phenol	K	M	C	D
24	2,3,7,8-TCDD	K			
	2,3,7,8-TCDF				
M8	BOD, 5 day, Total Demand	K	M	C	D
M13	Adsorbable Organic Halide (AOX)	K			D

Legend
K = Sulphate (Kraft) Category
M = Sulphite-Mechanical Category
C = Corrugating Category
D = Deinking/Board/Fine Papers/Tissue Category

5.3 THE DEVELOPMENT OF EFFLUENT LIMITS

Monitoring Data Analysis

In chapter five of the report on Best Available Technology for the Ontario Pulp and Paper Industry, six mills are identified as having best available technology for the biological treatment of pulp and paper mill effluent. These mills are listed in Table 5.3.

Table 5.3
Mills with BAT Biological Effluent Treatment

Mill	Location	Wastewater Treatment
Alberta Newsprint	Whitecourt, Alberta	AST
Champion International	Canton, North Carolina	AST
E.B. Eddy	Espanola, Ontario	ASB
Kimberly-Clark	Terrace Bay, Ontario	ASB
P.H. Glatfelter	Spring Grove, Pennsylvania	AST
Weldwood	Hinton, Alberta	ASB

Legend
ASB = Aerated Stabilization Basin
AST = Activated Sludge Treatment system

Performance data from the three market kraft mills with aerated stabilization basin (ASB) effluent treatment were used in the development of effluent limits. Sulphate (kraft) mill effluent is generally considered to be more contaminated than other types of mill effluent and contains many different types of contaminants. Based on the 1990 MISA effluent monitoring results, 57 parameters were selected as candidate parameters for the sulphate (kraft) mills following candidate parameter selection and QA/QC data assessment versus 33 parameters for the sulphite-mechanical mills, 37 for the corrugating mills and 45 for the deinking/board/fine papers/tissue mills.

While it is recognized that mills with activated sludge treatment systems discharge lower levels of BOD and TSS than similar mills with ASB treatment systems (almost half as much), only the performance data from the mills with ASB treatment systems were considered in the development of effluent limits in order to take into account the fact that several Ontario mills have already invested heavily in ASB effluent treatment systems.

The development of effluent limits based on the performance data from the three BAT sulphate (kraft) mills with ASB effluent treatment systems also ensures that all of the mills in Ontario, regardless of mill type, age and location, will be able to comply with the effluent limits if the necessary treatment systems are installed and the necessary in-plant process modifications are made.

The use of sulphate (kraft) performance data to develop effluent limits for the different types of mill in Ontario is based on the BAT consultant claim that the quality of treated mill effluent achievable by each mill in Ontario should be the same regardless of the type of mill and should only depend on whether activated sludge treatment (AST) or ASB treatment is installed. The industry members of the ELS subcommittee do not agree with the BAT consultant on this issue and do not accept that the quality of effluent from a secondary effluent treatment system is independent of influent quality, regardless of how well the system is designed and operated.

As an initial basis upon which to develop effluent limits, the ministry accepted the BAT consultant claim that while the characteristics of the influent have a major impact on the design of the secondary effluent treatment system, the attainable effluent quality is independent of the type of influent. Accordingly, the data from E.B. Eddy (Espanola), Kimberly-Clark (Terrace Bay) and Weldwood (Hinton), the three market kraft mills with exemplary biological effluent treatment systems, were used in the development of effluent limits.

Average Production-Based Flowrate

The first step in the effluent limits setting process was to calculate the average production-based flowrate which was used to develop scalable production-based limits for the mills in the sector. The 1990 average production data and flowrate data for Kimberly-Clark (Terrace Bay) and Weldwood (Hinton) were used to calculate the average production-based flowrate. The data from E.B. Eddy (Espanola) could not be used due to the discovery of three systemic flow measurement device errors halfway through the effluent monitoring period. Table 5.4 lists the average production-based flowrates for Kimberly-Clark (Terrace Bay) and Weldwood (Hinton).

Table 5.4
Average Production-Based Flowrates

Mill	Average Production (tonne/day)	Average Flow (m^3/day)	Average Production-Based Flow (m^3/tonne)
Kimberly-Clark (Terrace Bay)	1,110	91,695	83
Weldwood	1,006	90,000	89
Average BAT Flowrate			86

Long-term Average (LTA) Concentrations

The second step in the effluent limits setting process was to calculate the long-term average concentration of each parameter to be limited. Long-term average (LTA) concentrations were calculated as the arithmetic mean of all the data collected and were calculated where possible, on a mill by mill basis, for all of the parameters identified in the Final Candidate Parameter List. Since the LTA concentrations of toluene and phenol in the treated process effluent from E.B Eddy (Espanola) and Kimberly-Clark (Terrace Bay) were less than the respective regulation method detection limits for each parameter, the LTA average concentrations for toluene and phenol were set at the respective RMDLs for the purpose of effluent limits setting.

LTA concentrations were not calculated for 2,3,7,8-TCDD and 2,3,7,8-TCDF because the Effluent Limits Regulation will require non-measurable concentrations of 2,3,7,8-TCDD and 2,3,7,8-TCDF in mill effluent due to the significant threat they pose to human health and the environment.

Table 5.5 lists the average LTA concentrations to three significant figures for the candidate parameters to be limited.

Table 5.5
Long-term Average Concentrations

Parameter	Kimberly-Clark	E.B. Eddy (Espanola)	Weldwood (Hinton)	Average
BOD, 5 day, Total Demand (mg/L)	15.7	17.3	25.7	19.6
Total Suspended Solids (mg/L)	42.5	25.0	35.6	34.4
Adsorbable Organic Halide (AOX) (mg/L)	21.2	8.20	10.9	13.4
Total Phosphorus (mg/L)	0.489	0.512	1.13	0.710
Ammonia plus Ammonium (mg/L)	0.923	1.01	N/A	0.967
Chloroform (µg/L)	12.0	16.4	N/A	14.2
Toluene (µg/L)	*	*	*	0.500
Phenol (µg/L)	*	*	*	2.40

Legend
N/A = no data available
* = Data not used in the calculation of the long-term average concentration.

Concentration Variability Factors

The third step in the effluent limits setting process was to calculate concentration variability factors that take into account analytical and sampling uncertainty, process and plant variations, treatment process fluctuations that result from changes in raw waste load and flow, and operational changes in the treatment system.

The daily variability factor, VF_1, is used to set daily maximum performance values and is calculated as the ratio of the 99th percentile of the data to the expected mean based on the distribution of the data.

The monthly variability factor, either VF_4 or VF_{30} depending on whether 4 or 30 samples are collected during the month, is used to set monthly average performance values and is calculated as the ratio of the 95th percentile of the data to the expected mean based on the distribution of the data.

Tables 5.6 and 5.7 list the daily and monthly variability factors to three significant figures for the candidate parameters to be limited with the exception of the parameters 2,3,7,8-TCDD and 2,3,7,8-TCDF which are treated separately.

Table 5.6
Daily Variability Factors

Parameter	Kimberly-Clark	E.B. Eddy (Espanola)	Weldwood (Hinton)	Average
BOD, 5 day, Total Demand	2.66	4.36	1.64	2.89
Total Suspended Solids	1.62	2.28	2.66	2.19
Adsorbable Organic Halide (AOX)	1.38	1.74	1.44	1.52
Total Phosphorus	1.64	1.88	2.99	2.17
Ammonia plus Ammonium	3.68	2.57	N/A	3.13
Chloroform	2.76	3.33	N/A	3.05
Toluene	*	*	*	3
Phenol	*	*	*	2

Legend
N/A = no data available
* = Data not used in calculation of daily variability factor.

Table 5.7
Monthly Variability Factors

Parameter	Factor Type	Kimberly-Clark	E.B. Eddy (Espanola)	Weldwood (Hinton)	Average
BOD, 5 day, Total Demand	VF_{30}	1.40	1.47	N/A	1.44
Total Suspended Solids	VF_{30}	1.15	1.43	N/A	1.29
Adsorbable Organic Halide (AOX)	VF_4	1.15	1.26	1.14	1.18
Total Phosphorus	VF_4	1.17	1.26	1.52	1.32
Ammonia plus Ammonium	VF_4	1.70	1.55	N/A	1.63
Chloroform	VF_4	1.47	1.60	N/A	1.54
Toluene	VF_4	*	*	*	3
Phenol	VF_4	*	*	*	2

Legend
N/A = no data available
* = Data not used in the calculation of the monthly variability factor.

In order to set variability factors for toluene and phenol, where the majority of the effluent monitoring data were at lower levels than the respective RMDL for each parameter, it was necessary to review the toluene and phenol QA/QC data. For the parameter toluene, small corrections were made to the test results by the analytical laboratories performing the chemical analyses in order to take into account laboratory blank corrections. A variability factor of 3 was considered appropriate by the Ministry in order to compensate for the potential bias and/or additional variability that is introduced to low level data when laboratory blank corrections are made.

For the parameter phenol, laboratory blank corrections were not normally made or required. A variability factor of 2 was considered appropriate by the Ministry in order to ensure that repeat analytical results do not differ from the average by more than 30%, more than 5% of the time.

Outlier Analysis

In order to assess whether the calculated BAT LTA concentrations and variability factors are representative of normal plant operating conditions, extreme or outlier data values were reviewed. Outlier values may result from plant and process upsets, QA/QC problems, sampling errors or unknown causes. They may be non-representative of normal plant operating conditions or may be indicative or other environmental problems requiring investigation.

Extreme or outlier values were removed from the database (outliers excluded) and a comparison was made to the original database (outliers included). LTA concentration results and daily and monthly variability factors are presented in Tables 5.8 to 5.10 to three significant figures for both sets of data in order to show the effects of outlier removal.

The ELS subcommittee examined the data (outliers included and outliers excluded) for each parameter and concluded that all of the data (outliers included) should be used for effluent limits setting because the data reflect the normal plant operations of the BAT(EA) mills over the effluent monitoring period.

Table 5.8
Long-term Average Concentrations
(Outliers Included and Outliers Excluded)

Parameter	RMDL	LTA (outliers included)	LTA (outliers excluded)
BOD, 5 day, Total Demand	5 mg/L	19.6	18.7
Total Suspended Solids	5 mg/L	34.4	33.7
Adsorbable Organic Halide (AOX)	0.05 mg/L	13.4	13.4
Total Phosphorus	0.1 mg/L	0.710	0.662
Ammonia plus Ammonium	0.25 mg/L	0.967	0.967
Chloroform	0.7 μg/L	14.2	13.0

Legend
RMDL = Regulation Method Detection Limit

Table 5.9
Daily Variability Factors
(Outliers Included and Outliers Excluded)

Parameter	Daily Variability Factor (outliers included)	Daily Variability Factor (outliers excluded)
BOD, 5 day, Total Demand	2.89	2.07
Total Suspended Solids	2.19	2.10
Adsorbable Organic Halide (AOX)	1.52	1.43
Total Phosphorus	2.17	1.88
Ammonia plus Ammonium	3.13	3.13
Chloroform	3.05	2.79

Table 5.10
Monthly Variability Factors
(Outliers Included and Outliers Excluded)

Parameter	Factor Type	Monthly Variability Factor (outliers included)	Monthly Variability Factor (outliers excluded)
BOD, 5 day, Total Demand	VF_{30}	1.44	1.31
Total Suspended Solids	VF_{30}	1.29	1.28
Adsorbable Organic Halide (AOX)	VF_4	1.18	1.18
Total Phosphorus	VF_4	1.32	1.28
Ammonia plus Ammonium	VF_4	1.63	1.63
Chloroform	VF_4	1.54	1.48

BAT(EA) Performance Values

The fourth step in the effluent limits setting process was to calculate BAT(EA) performance values for each parameter to be limited. During the technical review of BAT(EA) performance data, the industry members of the Effluent Limits Setting Subcommittee identified several concerns with the applicability of some of the performance data to Ontario mills. The industry members argued that the types of wood furnish used by Ontario mills, the age and diversity of Ontario mills and the northern location of some of the mills should be considered in the setting of daily and monthly performance values.

The industry members of the subcommittee presented data that showed that bleached kraft mills generally discharge less BOD and less AOX when bleaching hardwood than when bleaching softwood. The industry subcommittee members argued that effluent limits should be based on 100% softwood furnish in order to reflect the fact that Ontario mills use a combination of hardwood and softwood furnish.

The ministry members of the subcommittee requested the assistance of the BAT consultant to review the industry concerns. The BAT consultant confirmed that prior to effluent treatment, bleached kraft mills using 100% softwood furnish produce more BOD. However, the consultant noted that following secondary treatment, there should not be any difference in the quality of treated mill effluent since the quality of the effluent depends primarily on the design and operation of the external effluent treatment system.

The BAT consultant agreed with industry's claim that the use of hardwood furnish requires less bleaching chemicals and leads to lower AOX discharges than with the use of softwood furnish. The consultant recommended that since mills currently bleaching hardwood could find themselves bleaching some softwood in the future due to market pressures, AOX limits should be developed based on the use of 100% softwood furnish.

The industry members of the subcommittee questioned whether all of the Ontario mills, given the diversity of the mills, could be successfully modified to discharge the same quality of effluent as the identified BAT(EA) mills. They noted that the majority of Ontario mills are quite old and it may not be possible to retrofit all of the mills to achieve the same quality of effluent discharge as the identified BAT mills. The BAT consultant responded that the external effluent treatment systems that will be installed in order to comply with the requirements of the effluent limits regulation, will be 'new' installations and that all of the identified BAT in-plant process modifications are technically feasible at Ontario mills.

Concerning the cold weather performance of biological effluent treatment systems in Northern Ontario, specifically aerated stabilization basin (ASB) performance, the industry members of the subcommittee argued that with the exception of ASB's treating sulphate (kraft) effluent, ASB treatment performance would be impaired during cold weather operation. The BAT consultant responded that cold weather performance should be taken into account when designing and selecting the type of effluent treatment system.

After much debate and discussion, the industry and ministry members of the ELS subcommittee agreed that some of the mills in Ontario would have problems in meeting effluent limits based purely on the BAT(EA) performance data. Accordingly, the consensus of the ELS subcommittee was that the performance values for BOD, TSS and AOX should be adjusted in order to take into account the type of wood furnish used by Ontario mills, the age and diversity of Ontario mills and the Northern location of some of the mills.

The ELS subcommittee also recognized that the development of one set of limits, that could be applied uniformly and equitably across the pulp and paper sector, would be highly desirable for both administrative purposes and enforcement purposes.

The consensus of the ELS subcommittee was that all of the mills in the Province will be able to meet BOD and TSS monthly production-based limits of 5 kg/tonne following the installation of BAT(EA). Similarly, the subcommittee agreed that all of the mills that bleach pulp using chlorine and chlorine-containing compounds will be able to meet an AOX monthly production-based limit of 1.5 kg/tonne. Maximum daily BOD, TSS and AOX limits were subsequently calculated by dividing the monthly limit for each parameter by the respective monthly variability factor and by the average production-based flowrate.

Table 5.11 lists the BOD, TSS and AOX LTA concentration values that were calculated using BAT mill performance data and the 'adjustments' that were made by the ELS subcommittee for the purpose of setting effluent limits.

Table 5.11
Calculated and Adjusted Long-term Average Concentrations

Parameter	Calculated BAT Long-term Average Concentration (mg/L)	Adjusted Long-term Average Concentration (mg/L)
BOD, 5 day, Total Demand	19.6	40.4
Total Suspended Solids	34.4	45.1
Adsorbable Organic Halide (AOX)	13.4	14.8

Table 5.12 presents the daily and monthly production-based limits that were developed by the ELS subcommittee. The limits were calculated for each parameter be multiplying the LTA concentration for the parameter to be limited by the appropriate parameter variability factor and by the average production-based flowrate of 86 m^3/tonne. In order to calculate mill-specific effluent limits, it is necessary to multiply the production-based limits by the mill's reference production rate.

Table 5.12
ELS Subcommittee Recommended Production-based Loading Limits

Parameter	LTA Concentration (mg/L)	Daily Variability Factor	Monthly Variability Factor	Estimated LTA (kg/tonne)	Daily Limit (kg/tonne)	Monthly Limit (kg/tonne)
BOD, 5 day, Total Demand	40.4	2.89	1.44	3.47	10.0	5.00
Total Suspended Solids	45.1	2.19	1.29	3.88	8.49	5.00
Adsorbable Organic Halide (AOX)	14.8	1.52	1.18	1.27	1.93	1.50
Total Phosphorus	0.71	2.17	1.32	0.0611	0.133	0.0806
Ammonia plus Ammonium	0.97	3.13	1.63	0.0834	0.261	0.136
Chloroform	* 14.2	3.05	1.54	0.00122	0.00372	0.00188
Toluene	* 0.50	3	3	0.0000430	0.000129	0.000129
Phenol	* 2.40	2	2	0.000206	0.000413	0.000413

Legend
* = micrograms per litre

Note
Mill Limit = Production-based limit x mill reference production rate

Ministry and Industry Review

Following the ELS subcommittee deliberations, the draft production-based limits were presented to the Ministry and Industry for internal review. Following their review of the proposed limits, industry argued that many of the proposed limits were too stringent and would place an undue financial burden on some of the Ontario mills. Industry felt that two issues in particular warranted further consideration, namely the need for biological treatment of mill effluent and the basis for the AOX limit.

The ministry review of the proposed production-based limits indicated that the limits were not stringent enough because some of the mills were currently operating at levels well below the proposed limits.

In order to resolve the industry and ministry concerns with the limits recommended by the ELS subcommittee, a Pulp and Paper Working Group was formed within the ministry to review the ELS subcommittee recommended limits and, if necessary, develop a more appropriate set of limits that could be applied to the mills in the sector.

The Pulp and Paper Working Group

The Pulp and Paper Working Group conducted a detailed review of all of the available information including the recommendations of the report on Best Available Technology for the Ontario Pulp and Paper Industry, the 1990 MISA effluent monitoring data, existing Control Orders and Certificates of Approval and pulp and paper regulations in other provinces, states and countries.

The Pulp and Paper Working Group specifically reviewed the LTA concentration values which the ELS subcommittee used to develop the preliminary effluent limits and reviewed the arguments put forth by industry against using the levels recommended by the BAT consultant. Based on this review, the Pulp and Paper Working Group accepted the LTA concentration values recommended by the ELS subcommittee.

Please Note:	The issue of AOX is still under review within the Ministry.

The Pulp and Paper working group had a major concern with the approach of applying one set of effluent limits to all mills in the sector in that many of the mills are currently operating at levels well below the effluent limits proposed by the ELS subcommittee. The working group looked at various ways and means of adjusting the proposed effluent limits to accommodate the variety of mills in the sector and finally concluded that the most appropriate approach to take would be to adjust the limits in accordance with production-based flowrates for each category of mill identified in the MISA Effluent Monitoring Regulation.

Accordingly the Pulp and Paper Working Group developed the category specific flowrates listed in Table 5.13 and described in detail below:

Table 5.13
Category Specific Production-Based Flowrates

Category	Production-Based Flowrates (m^3/tonne)
Sulphate (Kraft)	86
Sulphite-Mechanical	75
Corrugating	50
Deinking/Board/Fine Papers/Tissue	50

- For mills in the Sulphate (Kraft) Category, the working group agreed that the flowrate of 86 m^3/tonne of production, which was the flowrate on which the ELS subcommittee had based its proposed limits, was appropriate.

- For the mills in the Sulphite-Mechanical Category, the working group acknowledged that the BAT consultant recommended flowrate of 50 m^3/tonne was overly restrictive and that a flowrate of 86 m^3/tonne was overly excessive. Therefore, the working group recommended that a flowrate of 75 m^3/tonne of production, which recognizes that these mills do not have to undertake the extensive pulp washing of kraft mills, should be used for mills in this category.

- For the mills in the Corrugating and Deinking/Board/Fine Papers/Tissue Categories, the working group accepted that the flowrate of 50 m^3/tonne of production recommended by the BAT consultant was appropriate.

Category Specific Production-Based Limits

The category specific production-based flowrates listed in Table 5.13 were used to recalculate production-based limits for each of the four pulp and paper sector categories. Table 5.14 lists the production-based limits for the sulphate (kraft) category that were calculated using an average production-based flowrate of 86 m^3/tonne of product.

Tables 5.15 to 5.17 list the production-based limits for the sulphite-mechanical, corrugating, and deinking/board/fine papers/tissue categories respectively that were calculated using the average production-based flowrates of 75, 50, and 50 m^3/tonne of product respectively.

In order to calculate the mill-specific maximum daily and average monthly loading limits (kg/day), the category specific production-based limits are multiplied by the reference production rate for each mill.

Reference Production Rates

The reference production rates used in the calculation of the daily and monthly loading limits were calculated by the BAT consultant and are based on production data that were supplied to the consultant by each of the mills.

The reference production rate for each mill was calculated as the production rate that was exceeded on only 10% of the days that the mill operated during the production period. It reflects the mill production rate under normal operating conditions and corresponds quite closely with standard engineering design assumptions for selecting mill equipment.

The total mill reference production rate is used to calculate daily and monthly limits for all of the parameters and refers to the number of tonnes of machine dry product leaving the mill.

Table 5.14
Sulphate (Kraft) Category Production-Based Loading Limits (kg/tonne)

Parameter	Daily Limit	Monthly Limit	Estimated Long-term Average Loading
BOD, 5 day, Total Demand	10.0	5.00	3.47
Total Suspended Solids	8.49	5.00	3.88
Total Phosphorus	0.133	0.0806	0.0611
Ammonia plus Ammonium	0.261	0.136	0.0834
Chloroform	0.00372	0.00188	0.00122
Toluene	0.000129	0.000129	0.0000430
Phenol	0.000413	0.000413	0.000206
2,3,7,8-TCDD	NM	NM	NM
2,3,7,8-TCDF	NM	NM	NM
Toxicity	Non-Acutely Lethal		

Legend
NM = Non-Measurable

Note
Mill Limit = Production-based limit x mill reference production rate

Table 5.15
Sulphite-Mechanical Category Production-Based Loading Limits (kg/tonne)

Parameter	Daily Limit	Monthly Limit	Estimated Long-term Average Loading
BOD, 5 day, Total Demand	8.76	4.36	3.03
Total Suspended Solids	7.41	4.36	3.38
Total Phosphorus	0.116	0.0703	0.0533
Ammonia plus Ammonium	0.228	0.119	0.0728
Chloroform	0.00325	0.00164	0.00107
Toluene	0.000113	0.000113	0.0000375
Phenol	0.000360	0.000360	0.000180
2,3,7,8-TCDD	NM	NM	NM
2,3,7,8-TCDF	NM	NM	NM
Toxicity	Non-Acutely Lethal		

Legend
NM = Non-Measurable

Note
Mill Limit = Production-based limit x mill reference production rate

Table 5.16
Corrugating Category Production-Based Loading Limits (kg/tonne)

Parameter	Daily Limit	Monthly Limit	Estimated Long-term Average Loading
BOD, 5 day, Total Demand	5.84	2.91	2.02
Total Suspended Solids	4.94	2.91	2.26
Total Phosphorus	0.0770	0.0469	0.0355
Ammonia plus Ammonium	0.152	0.0791	0.0485
Chloroform	0.00217	0.00109	0.000710
Toluene	0.0000750	0.0000750	0.0000250
Phenol	0.000240	0.000240	0.000120
2,3,7,8-TCDD	NM	NM	NM
2,3,7,8-TCDF	NM	NM	NM
Toxicity	Non-Acutely Lethal		

Legend
NM = Non-Measurable

Note
Mill Limit = Production-based limit x mill reference production rate

Table 5.17
Deinking/Board/Fine Papers/Tissue Category Production-Based Loading Limits (kg/tonne)

Parameter	Daily Limit	Monthly Limit	Estimated Long-term Average Loading
BOD, 5 day, Total Demand	5.84	2.91	2.02
Total Suspended Solids	4.94	2.91	2.26
Total Phosphorus	0.0770	0.0469	0.0355
Ammonia plus Ammonium	0.152	0.0791	0.0485
Chloroform	0.00217	0.00109	0.000710
Toluene	0.0000750	0.0000750	0.0000250
Phenol	0.000240	0.000240	0.000120
2,3,7,8-TCDD	NM	NM	NM
2,3,7,8-TCDF	NM	NM	NM
Toxicity	Non-Acutely Lethal		

Legend
NM = Non-Measurable

Note
Mill Limit = Production-based limit x mill reference production rate

Table 5.18 lists the total mill reference production rate that was used in the calculation of the daily and monthly average effluent loading limits for each mill.

Daily and Monthly Loading Limits

For each parameter, daily and monthly loading limits were calculated for each mill by multiplying the production-based limits by the mill reference production rate. The daily and monthly loading limits for each parameter are listed on a mill-by-mill basis in Schedule 2 of the Effluent Limits Regulation (see Appendix I).

"Not to Exceed" Concentration Limits

Daily "not to exceed" concentration limits were developed for all of the regulated parameters in order to control the discharge of highly concentrated effluents that may cause environmental degradation. The "not to exceed" limits were calculated by multiplying the LTA concentration for each parameter by the square of the parameter's daily variability factor. It is assumed that the square of the variability factor will take into account all of the variability that may occur within the day. A maximum cap of four times the adjusted LTA concentration was imposed on all of the parameters in order to control the variability that occurs within the day to an acceptable level. Table 5.19 lists the "not to exceed" concentrations for each parameter to be limited.

5.4 ENVIRONMENTAL BENEFIT

The proposed effluent limits for the MISA Pulp and Paper Sector represent a significant step forward in the overall protection of aquatic life and human health in Ontario and are a step forward towards the ministry's goal of the virtual elimination and zero discharge of persistent toxic substances. Table 5.20 presents the total load removed, the remaining load and the percent removal for each of the limited parameters with the exception of the special parameters 2,3,7,8-TCDD and 2,3,7,8-TCDF which will be controlled to non-measurable levels.

Table 5.18
Reference and Average Production Rates

Mill Name	Average Production Rate (tonne/day)	Reference Production Rate (tonne/day)
Abitibi-Price (Fort William)	371	428
Abitibi-Price (Iroquois Falls)	801	906
Abitibi-Price (Provincial Papers)	424	489
Abitibi-Price (Thunder Bay)	472	517
Beaver Wood Fibre Company	225	347
Boise Cascade (Fort Frances)	970	1,094
Boise Cascade (Kenora)	929	1,057
Canadian Pacific (Dryden)	965	1,258
Canadian Pacific (Thunder Bay)	2,290	2,584
Domtar Inc. (Cornwall)	726	856
Domtar Inc. (Red Rock)	819	976
Domtar Inc. (St. Catharines)	161	196
Domtar Inc. (Trenton)	327	382
E.B. Eddy (Espanola)	943	1,216
E.B. Eddy (Ottawa)	166	234
James River	425	523
Kimberly-Clark (Huntsville)	100	118
Kimberly-Clark (St. Catharines)	108	114
Kimberly-Clark (Terrace Bay)	1,110	1,308
Malette	298	390
MacMillan-Bloedel	274	301
Noranda	270	284
Quebec & Ontario	840	1,004
St. Marys	506	629
Spruce Falls	983	1,096
Strathcona	178	217
Trent Valley	305	342

Note: Reference production rates are based on the data supplied to the BAT consultants.

Table 5.19
"Not to Exceed" Concentrations

Analytical Test Group	Parameter	"Not to Exceed" Concentration
4a	Ammonia plus Ammonium	4 mg/L
6	Total Phosphorus	3 mg/L
8	Total Suspended Solids (TSS)	180 mg/L
16	Chloroform	57 µg/L
17	Toluene	2 µg/L
20	Phenol	10 µg/L
M8	BOD, 5 day, Total Demand	162 mg/L

Legend
NM = Non-Measurable

Table 5.20
Loading Removal Summary (kg/day)
For the MISA Pulp and Paper Sector

Parameter	MISA 1990 Loading	Total Load Removed	Estimated Load Remaining	Percent Removal
BOD, 5 day, Total Demand	340,000	290,000	50,000	85
Total Suspended Solids	97,100	41,200	55,900	42
Total Phosphorus	853	-28.0	881	-3
Ammonia plus Ammonium	956	-244	1,200	-26
Chloroform	453	435	17.6	96
Toluene	4.46	3.84	0.620	86
Phenol	25.6	22.6	2.97	88

Note: Total phosphorus and ammonia plus ammonium discharges may increase due to the installation of biological effluent treatment.

The following benefits to aquatic life, wildlife and human health are expected following industry compliance with the proposed effluent limits:

Benefits to Aquatic Life

- Mill effluents that are currently acutely lethal will be rendered non-acutely lethal to rainbow trout and Daphnia magna. This will protect fish and other forms of aquatic life.
- Loadings of persistent bioaccumulative substances will be reduced in areas with sediments already impacted by in-situ pollutants.
- Discharges of oxygen-demanding wastes will be reduced, permitting the survival of aquatic life in new locations and increasing the margin of safety from oxygen depletion in others.
- Reduction of oxygen-demanding wastes and suspended solids will limit degradation of river bottoms which may be currently unsuitable for aquatic life due to low oxygen and will reduce deposition on spawning grounds.

Benefits to Wildlife

- Reduced persistent bioaccumulative substance accumulation by top aquatic predators such as salmonids and possible reduction in toxic effects on top aquatic predator populations.
- Reduced persistent bioaccumulative substance accumulation in fish-eating wildlife and possible reduction in detrimental effects on bird populations.

Benefits to Human Health

- Reduced persistent bioaccumulative substance accumulation of chlorinated dioxins and furans in sport fish will permit increased consumption.
- Aesthetic improvements in water and shoreline quality near mill outfalls.
- Reduced tainting of fish flesh and water due to phenols.

(Notes)

REFERENCES

1. Ontario Ministry of the Environment (1990). MISA Issue Resolution Process Issue Resolution Committee Reports. Toronto, Ontario. ISBN 0-7729-7354-7

2. Ontario Ministry of the Environment (1986). Municipal-Industrial Strategy for Abatement (MISA). A Policy and Program Statement of the Government of Ontario on Controlling Municipal and Industrial Discharges into Surface Waters. Toronto, Ontario.

THE LIMITS REGULATION

CHAPTER 6

OF THE

DEVELOPMENT DOCUMENT

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6.1 THE LIMITS REGULATION

Purpose

The purpose of the Limits Regulation is to control the quality of effluent that is discharged directly to surface watercourses by pulp and paper mills in Ontario. This will be done by limiting the concentrations and loadings of the pollutants that are discharged in mill effluent and by requiring all effluent to be non-acutely lethal. The Limits Regulation will also monitor the discharge of all once-through cooling water effluent streams in order to ensure that these streams are non-lethal and contaminant-free.

Application

The Regulation applies to the twenty-seven direct discharge pulp and paper mills in Ontario listed in Schedule 1 of the Regulation.

Compliance

The compliance requirements of the Regulation come into effect three (3) years after the Regulation is promulgated. The regulated limits listed in Schedule 2 of the Regulation apply to process effluent. If a mill fails to comply with the requirements of Schedule 2 and a limit is exceeded, then it is subject to prosecution by the Ministry. The Regulation contains the following types of process effluent limits:

1) <u>"Not to exceed" concentration limits.</u> The concentration limits listed in Column 3 of Schedule 2 must not be exceeded at any time while a mill is discharging process effluent. In order to ensure compliance with these limits, the Ministry will periodically collect process effluent samples from each mill and measure the concentration of each parameter for which there is a concentration limit.

2) <u>Daily plant loading limits.</u> A mill must not exceed the daily plant loading limits listed in Column 4 of Schedule 2 on any operating day.

3) Monthly average loading limits. A mill must not exceed the monthly average plant loading limits listed in Column 5 of Schedule 2 during any month of the year.

4) pH. A mill must not discharge process effluent that has a pH below 6.0 or above 9.5 at any time.

5) Acute lethality. A mill must not discharge an effluent that is acutely lethal to either rainbow trout or Daphnia magna. An acutely lethal effluent is one that kills more than fifty percent of the test species in 100 percent (undiluted) effluent.

By-Passes

The Regulation prohibits emergency overflow discharges. All mill effluent must be discharged through designated sampling points only.

Sampling Points

A mill must designate sampling points on all process effluent and once-through cooling water effluent streams. All samples collected for the Regulation must be taken from designated sampling points.

Sampling and Analytical Procedures

In order to ensure the accurate sampling and analysis of effluent samples, standard sampling and analytical procedures have developed by the Ministry. The Ministry protocol on sampling and analysis[1] outlines how a mill must collect a sample, how the sample should be analyzed, and the minimum analytical method detection level that the laboratory must meet when analyzing the sample.

Each mill must guarantee that all sampling equipment is maintained properly in order to ensure that a representative sample is always collected.

Loading and Flow Calculations

Daily Plant Loadings. In order to determine compliance with the daily plant loading limits, a daily plant loading for each limited parameter must be calculated. This is done by multiplying the analytical result of the monitored parameter by the flowrate of the monitored effluent stream for the day of sampling. The following rules must be observed when calculating parameter loadings:

- If the parameter was not detected in the effluent and the method detection limit for the parameter is greater than or equal to 1/10th of the analytical method detection limit listed in the Ministry protocol on sampling and analysis[1], then the value of the method detection limit must be used.
- If the parameter was not detected in the effluent and the method detection limit for the parameter is less than 1/10th of the analytical method detection limit listed in the Ministry protocol on sampling and analysis[1], then the value of zero must be used.

If the calculated loading of the limited parameter exceeds the daily plant loading limit for that parameter, then the mill is considered to be out of compliance with the requirements of the Regulation.

Monthly Average Plant Loadings. In order to determine compliance with the monthly average plant loading limits, a monthly average plant loading for each limited parameter must be calculated. This is done by taking the average (arithmetic mean) of the daily plant loadings reported for the month. If the calculated loading of the limited parameter exceeds the monthly average plant loading limit for that parameter, then the mill is considered to be out of compliance with the requirements of the Regulation.

Effluent Volumes. A mill must calculate the daily plant volume of process effluent that is discharged each day that the mill is in operation. The mill must also calculate the daily plant volume of once-through cooling water effluent that is discharged on the days that once-through cooling water effluent samples are collected.

At the end of each month the mill must calculate the monthly average volume of effluent discharged during the month by taking the average (arithmetic mean) of the daily plant volumes reported for the month.

Flow Measurement

In order to determine daily and monthly plant loadings, each mill must continuously measure the daily flow of all process effluent streams. Each flow measurement device must:

- be installed properly and be easily accessible for inspection by a provincial officer; and,
- be accurate to within ±15%.

Each mill must also measure the flow of once-through cooling water on the day that samples are collected. Each flow measurement device must:

- be maintained in the same manner as the process effluent flow measurement devices; and,
- be accurate to within ±20%.

Limits Monitoring

Parameters. Pulp and paper mills must monitor process effluent for the following chemical parameters:

- pH
- Ammonia plus Ammonium
- Total Phosphorous
- Total Suspended Solids
- Chloroform
- Toluene
- Phenol
- 2,3,7,8-Tetrachlorinated dibenzo-p-dioxin
- 2,3,7,8-Tetrachlorinated dibenzofuran
- BOD, 5 day, Total Demand

Process Effluent. Using 24-hour composite sampling techniques, each mill is required to collect process effluent samples daily, weekly, and quarterly. The daily, weekly, and quarterly samples must be analyzed for the parameters for which the frequency of monitoring is indicated in Column 2 of Schedule 2 as being daily, weekly, and quarterly respectively. The frequency of monitoring for each limited parameter is shown in Table 6.1.

Table 6.1
Monitoring Frequency for Limited Parameters

Parameter	Frequency
pH	Daily
Ammonia plus Ammonium	Weekly
Total Phosphorus	Weekly
Total Suspended Solids	Daily
Chloroform	Weekly
Toluene	Weekly
Phenol	Weekly
2,3,7,8-tetrachlorinated dibenzo-p-dioxin	Quarterly
2,3,7,8-tetrachlorinated dibenzofuran	Quarterly
BOD, 5 day, Total Demand	Daily

In order to comply with the pH monitoring requirement of the Regulation, a mill must collect three grab samples daily, no sooner than six hours apart, and analyze each sample for pH.

Acute Lethality Testing. During the first year that the Regulation is in effect, each mill is required to conduct monthly acute lethality tests in order to determine whether the mill's process effluent or once-through cooling water effluent is acutely lethal to rainbow trout or *Daphnia magna*. The Environment Canada protocols on acute toxicity testing[2,3] describe the sampling and analytical procedures that have to be followed when conducting the acute lethality tests.

If a mill passes twelve consecutive acute lethality tests, then the mill is allowed to monitor acute lethality on a quarterly basis.

Chronic Toxicity Testing

When a mill passes twelve consecutive acute lethality tests and begins to perform the tests quarterly, it is required to monitor chronic toxicity to Ceriodaphnia dubia and fathead minnows once every six months. These 7-day tests study Ceriodaphnia dubia reproduction inhibition and survivability and fathead minnow growth inhibition in 100% process effluent and 100% once-through cooling water. The Environment Canada protocols on chronic toxicity testing[4,5] describe the sampling and analytical procedures that have to be followed when conducting the chronic toxicity tests.

Assessment Monitoring

Once-Through Cooling Water. Once-through cooling water effluent has to be monitored once per week for assessment purposes. Table 6.2 lists the parameters that have to be monitored.

Table 6.2
Once-Through Cooling Water Effluent
Assessment Monitoring Parameters

Analytical Test Group	Parameter
1	Chemical Oxygen Demand (COD)
3	pH
5a	Dissolved Organic Carbon (DOC)
7	Specific Conductance
8	Total Suspended Solids

Quality Control Monitoring

Each mill must collect once per year from one process effluent sampling point:

- a travelling blank sample for all the limited parameters except pH;
- a duplicate or replicate sample for all of the limited parameters; and
- a travelling spiked blank sample for chloroform, toluene and phenol.

The samples for quality control monitoring must be collected on the same day as the regular compliance monitoring samples for the limited parameters. Procedures for collecting these quality control samples are outlined in the Ministry of the Environment "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater[1]".

Storm Water Control Study

Each mill must complete a storm water control study within two years after the Regulation is enforced according to the Ministry of the Environment protocol for conducting a storm water control study[6].

6.2 RECORD KEEPING AND REPORTING

Each mill must keep all records (concentration, flow and toxicity) in an electronic format for each process effluent and once-through cooling water effluent stream. The mill must also keep records of all malfunctions related to effluent sampling, chemical analysis, toxicity testing, and flow measurement or other problems that interfere with meeting the requirements of the Regulation. All records must be kept on file for five years.

Each mill must provide to the Ministry:

- An annual summary of all test results (concentration, flow and toxicity) and all non-compliance events that exceeded loading or pH limits on or before June 1st of each year;

- A three-month summary of all test results (concentration, flow and toxicity) and all non-compliance events that exceeded loading or pH limits within 45 days of the end of the three-month period;

- A report on any by-passes as soon as possible; and

- A summary of all chronic toxicity test results within 60 days after the semi-annual period in which the samples were collected.

6.3 TIMING

Each mill must start monitoring and reporting the results of all tests 90 days after the Regulation has been filed. The limits do not come into effect until the fourth year after the Regulation has been filed.

REFERENCES

1. Ontario Ministry of the Environment (1991). "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater". Toronto, Ontario.

2. Environment Canada (1990). "Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout". Toronto, Ontario.

3. Environment Canada (1990). "Reference Method for Determining Acute Lethality of Effluents to Daphnia magna". Toronto, Ontario.

4. Environment Canada (1992). Test of Reproduction and Survival Using the Cladoceran Ceriodaphnia dubia". Toronto, Ontario.

5. Environment Canada (1992). "Test of Larval Growth and Survival Using Fathead Minnows". Toronto, Ontario.

6. Ministry of the Environment (1992). "MISA Protocol For Conducting A Storm Water Control Study". Toronto, Ontario.

THE EFFLUENT LIMITS REGULATION

APPENDIX I

OF THE

DEVELOPMENT DOCUMENT

Ontario Regulation 760/93
Made Nov. 24, 1993
Filed November 25, 1993
Ontario Gazette December 11, 1993

REGULATION MADE UNDER THE
ENVIRONMENTAL PROTECTION ACT

EFFLUENT MONITORING AND EFFLUENT LIMITS - PULP AND PAPER SECTOR

PART I

GENERAL

Interpretation

1.-(1) In this Regulation,

"AOX" means adsorbable organic halide;

"assessment parameter" means a parameter that is listed in Schedule 3;

"bleached pulp" means pulp that has been bleached through the use of chlorine or chlorine compounds;

"blowdown water" means recirculating water that is discharged from a cooling water system for the purpose of controlling the level of water in the cooling water system or for the purpose of discharging from the cooling water system materials contained in the cooling water system the further build-up of which would impair the operation of the system;

"cooling water effluent" means water and associated material that is used in an industrial process for the purpose of removing heat and that has not, by design, come into contact with process materials, but does not include blowdown water;

"cooling water effluent monitoring stream" means a cooling water effluent stream on which a sampling point is established under section 8;

"cooling water effluent sampling point" means a sampling point established on a cooling water effluent stream under section 8;

"Director", in relation to obligations of a discharger, means a Director appointed under section 5 of the Act and

responsible for the region in which the discharger's plant is located and includes an alternate named by the Director;

"discharger" means an owner or person in occupation or having the charge, management or control of a plant to which this Regulation applies;

"dried" includes machine dried and, in relation to bleached pulp or other types of pulp, means dried in a manner so that the moisture content of the pulp does not exceed 10 per cent;

"finished product" means pulp, paper and paper products that have completed the production process at a plant, and includes bleached pulp;

"limited parameter", in relation to a plant, means a parameter for which a limit is specified for the plant in column 3 or 4 of Schedule 2;

"pick up", in relation to a sample, means pick up for the purpose of transportation to and analysis at a laboratory;

"plant" means an industrial facility and the developed property, waste disposal sites and wastewater treatment facilities associated with it;

"process change" means a change in equipment, production processes, process materials or treatment processes;

"process effluent" means,

(a) effluent that, by design, has come into contact with process materials,

(b) blowdown water,

(c) effluent that results from cleaning or maintenance operations at a plant during a period when all or part of the plant is shut down,

(d) effluent from a waste disposal site at a plant,

(e) effluent from a bark storage site at a plant,

(f) effluent that is discharged from an intake water treatment operation at a plant, but does not include effluent that is discharged from an intake water screening operation at a plant, and

(g) any effluent described in clauses (a) to (f) combined with cooling water effluent or storm water effluent;

"process effluent monitoring stream" means a process effluent stream on which a sampling point is established under section 8;

"process effluent sampling point" means a sampling point established on a process effluent stream under section 8;

"process materials", in relation to a discharger's plant, means raw materials for use in an industrial process at the plant, manufacturing intermediates produced at the plant, or products or by-products of an industrial process at the plant, but does not include chemicals added to cooling water for the purpose of controlling organisms, fouling and corrosion;

"pulp" means processed cellulose fibre that is derived from wood, other plant material or recycled paper products;

"quarter" means all or part of a period of three consecutive months beginning on the first day of January, April, July or October;

"semi-annual period" means all or part of a period of six months beginning on the first day of January or July;

"specific parameter", in relation to a plant, means 2,3,7,8 - tetrachlorodibenzo-para-dioxin, 2,3,7,8-tetrachlorodibenzofuran, and 2,3,7,8 substituted dioxin and furan congeners;

"storm water effluent" means run-off from a storm event or thaw that is not used in any industrial process.

(2) For greater certainty, this Regulation applies both to effluent streams that discharge continuously and to effluent streams that discharge intermittently.

(3) An obligation on a discharger to do a thing under this Regulation is discharged if another person has done it on the discharger's behalf.

Purpose

2. The purpose of this Regulation is to monitor and control the quality of effluent discharged from the plants listed in Schedule 1 and to require dischargers to prepare reports that describe methods that could be used to work toward the Ministry's

goal of eliminating the generation of AOX at dischargers' plants by the year 2002.

Application

3.-(1) This Regulation applies only with respect to the plants listed in Schedule 1.

(2) This Regulation does not apply with respect to the discharge of effluent to a municipal sewer.

Requirements Under Approvals, Orders, etc.

4. For greater certainty, the requirements of this Regulation are in addition to and independent of requirements in an approval, order, direction or other instrument issued under any Act.

Non-application of General Effluent Monitoring Regulation

5. This Regulation is not a Sectoral Effluent Monitoring Regulation within the meaning of Ontario Regulation 695/88.

By-passes

6. Beginning on January 1, 1996, a discharger shall not permit process effluent to be discharged from the discharger's plant unless the process effluent flows past a sampling point established on a process effluent stream in accordance with this Regulation before being discharged.

Sampling and Analytical Procedures

7.-(1) Each discharger shall carry out the establishment of sampling point obligations of this Regulation and the sampling and analysis obligations of this Regulation, including quality control sampling and analysis obligations, in accordance with the procedures described in the Ministry of Environment and Energy publication entitled "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater", dated July, 1993.

(2) Each discharger shall maintain the sampling equipment used at the discharger's plant for sampling required by this Regulation in a way that ensures that the samples collected at the plant under this Regulation accurately reflect the level of discharge of each limited parameter, assessment parameter and specific parameter from the plant.

PART II

SAMPLING POINTS

Establishment and Elimination of Sampling Points

8.-(1) Each discharger shall, by February 23, 1994, establish a sampling point on each process effluent and cooling water effluent stream at the discharger's plant, as necessary so that the plant loadings calculated under sections 12 and 13 for each limited parameter and assessment parameter and the concentrations determined for each specific parameter accurately reflect the level of discharge of each such parameter from the plant.

(2) If circumstances change so that a new sampling point is necessary at a discharger's plant in order to permit the calculation of plant loadings under sections 12 and 13 for each limited parameter and assessment parameter and the determination of concentrations for each specific parameter that accurately reflect the level of discharge of each such parameter from the plant, the discharger shall, within thirty days of the change, establish the new sampling point.

(3) A discharger may eliminate a sampling point established under subsection (1) or (2) if the sampling point is no longer necessary to permit the calculation of plant loadings under sections 12 and 13 for each limited parameter and assessment parameter and the determination of concentrations for each specific parameter that accurately reflect the level of discharge of each such parameter from the plant.

(4) For the purposes of this section, a plant loading for a parameter or a concentration for a parameter that is based on analytical results that are significantly affected by dilution or masking due to the merging of streams upstream of a sampling point at a plant is not a loading or a concentration that accurately reflects the level of discharge of the parameter from the plant.

(5) In determining what is necessary to meet a discharger's obligations to establish sampling points under this section, the discharger shall consider both which streams should have sampling points and where on a stream a sampling point should be located.

Reports on Sampling Points

9.-(1) By March 7, 1994, each discharger shall submit to the Director a list and plot plan showing the sampling points established under this Regulation at the discharger's plant as of February 23, 1994.

(2) Within thirty days after establishing a sampling point under this Regulation that is not shown on a list and plot plan submitted under this section, the discharger shall give the Director a written notice describing the location of the sampling point, together with a revised list and plot plan showing the sampling point.

(3) Within thirty days after eliminating a sampling point under this Regulation that is shown on a list and plot plan submitted under this section, the discharger shall give the Director a written notice describing where the sampling point used to be, together with a revised list and plot plan without the sampling point.

Use of Sampling Points Established Under This Part

10. Subject to section 22, each discharger shall use the sampling points established under this Part for all sampling required by this Regulation.

PART III

CALCULATION OF LOADINGS

Calculation of Loadings - General

11.-(1) For the purposes of performing a calculation under sections 12 and 13, a discharger shall use the actual analytical result obtained by the laboratory.

(2) Despite subsection (1), where the actual analytical result is less than one-tenth of the analytical method detection limit set out in the Ministry of Environment and Energy publication entitled "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" dated July, 1993, the discharger shall use the value zero for the purpose of performing a calculation under sections 12 and 13.

(3) Each discharger shall ensure that each calculation of a process effluent loading required by section 12 is performed as soon as reasonably possible after the analytical result on which the calculation is based becomes available to the discharger.

(4) Each discharger shall ensure that each calculation of a cooling water effluent loading required by section 13 is performed in time to comply with subsection 34(4).

Calculation of Loadings - Process Effluent

12.-(1) Each discharger shall calculate, in kilograms, a daily process effluent stream loading for each limited parameter in each process effluent monitoring stream of the discharger for each day on which a sample is collected under this Regulation from the stream for analysis for the parameter.

(2) When calculating a daily stream loading under subsection (1), the discharger shall multiply, with the necessary adjustment of units to yield a result in kilograms, the analytical result obtained from the sample for the parameter by the daily volume of effluent, as determined under section 27, for the stream for the day.

(3) Each discharger shall calculate, in kilograms, a daily process effluent plant loading for each limited parameter for each day for which the discharger is required to calculate a daily process effluent stream loading for the parameter under subsection (1).

(4) For the purposes of subsection (3), a daily process effluent plant loading for a parameter for a day is the sum, in kilograms, of the daily process effluent stream loadings for the parameter calculated under subsection (1) for the day.

(5) Where a discharger calculates only one daily process effluent stream loading for a parameter for a day under subsection (1), the daily process effluent plant loading for the parameter for the day for the purposes of subsection (3) is the single daily process effluent stream loading for the parameter for the day.

(6) Each discharger shall calculate, in kilograms, a monthly average process effluent plant loading for each limited parameter for each month in which a sample is collected under this Regulation more than once from a process effluent monitoring stream at the discharger's plant for analysis for the parameter.

(7) For the purposes of subsection (6), a monthly average process effluent plant loading for a parameter for a month is the arithmetic mean of the daily process effluent plant loadings for the parameter calculated under subsection (3) for the month.

Calculation of Loadings - Cooling Water

13.-(1) Each discharger shall calculate, in kilograms, a daily cooling water effluent stream loading for each assessment parameter in each cooling water effluent monitoring stream of the discharger for each day on which a sample is collected under this Regulation from the stream for analysis for the parameter.

(2) When calculating a daily stream loading under subsection (1), the discharger shall multiply, with the necessary adjustment of units to yield a result in kilograms, the analytical result obtained from the sample for the parameter by the daily volume of effluent, as determined under section 27, for the stream for the day.

(3) Each discharger shall calculate, in kilograms, a daily cooling water effluent plant loading for each assessment parameter for each day for which the discharger is required to calculate a daily cooling water effluent stream loading for the parameter under subsection (1).

(4) For the purposes of subsection (3), a daily cooling water effluent plant loading for a parameter for a day is the sum, in kilograms, of the daily cooling water effluent stream loadings for the parameter calculated under subsection (1) for the day.

(5) Where a discharger calculates only one daily cooling water effluent stream loading for a parameter for a day under subsection (1), the daily cooling water effluent plant loading for the parameter for the day for the purposes of subsection (3) is the single daily cooling water effluent stream loading for the parameter for the day.

(6) Each discharger shall calculate, in kilograms, a monthly average cooling water effluent plant loading for each assessment parameter for each month in which a sample is collected under this Regulation more than once from a cooling water effluent monitoring stream at the discharger's plant for analysis for the parameter.

(7) For the purposes of subsection (6), a monthly average cooling water effluent plant loading for a parameter for a month is the arithmetic mean of the daily cooling water effluent plant loadings for the parameter calculated under subsection (3) for the month.

PART IV

PARAMETER AND LETHALITY LIMITS

Parameter Limits

14.-(1) Subject to subsection (2) and section 15, each discharger shall ensure that each daily process effluent plant loading calculated for a parameter under section 12 in connection with the discharger's plant does not exceed the daily plant loading limit specified for the parameter and the plant in Column 3 of Schedule 2.

(2) Subject to section 15, each discharger for which a daily plant loading limit for AOX is listed in Column 3 of Schedule 2 shall ensure that each daily process effluent plant loading calculated for the parameter under section 12 in connection with the discharger's plant,

(a) from February 23, 1994 to December 30, 1995, does not exceed the phase-one daily plant loading limit specified for the parameter and the plant in Column 3 of Schedule 2;

(b) from December 31, 1995 to December 30, 1999, does not exceed the phase-two daily plant loading limit specified for the parameter and the plant in Column 3 of Schedule 2; and

(c) on and after December 31, 1999, does not exceed the phase-three daily plant loading limit specified for the parameter and the plant in Column 3 of Schedule 2.

(3) Subject to subsection (4) and section 15, each discharger shall ensure that each monthly average process effluent plant loading calculated for a parameter under section 12 in connection with the discharger's plant does not exceed the monthly average plant loading limit specified for the parameter and the plant in Column 4 of Schedule 2.

(4) Subject to section 15, each discharger for which a monthly average plant loading limit for AOX is listed in Column 4 of Schedule 2 shall ensure that each monthly average process effluent plant loading calculated for the parameter under section 12 in connection with the discharger's plant,

(a) from February 23, 1994 to December 30, 1995, does not exceed the phase-one monthly average plant loading limit specified for the parameter and the plant in Column 4 of Schedule 2;

(b) from December 31, 1995 to December 30, 1999, does not exceed the phase-two monthly average plant loading limit specified for the parameter and the plant in Column 4 of Schedule 2; and

(c) on and after December 31, 1999, does not exceed the phase-three monthly average plant loading limit specified for the parameter and the plant in Column 4 of Schedule 2.

(5) Each discharger shall control the quality of each process effluent monitoring stream at the discharger's plant to ensure that the concentration of 2,3,7,8-tetrachlorodibenzo-para-dioxin and the concentration of 2,3,7,8-tetrachlorodibenzofuran are both non-measurable in any sample collected at a process effluent sampling point at the plant.

(6) For the purposes of subsection (5), the concentration of 2,3,7,8-tetrachlorodibenzo-para-dioxin in a sample is non-measurable if analysis of the sample shows a concentration of 2,3,7,8-tetrachlorodibenzo-para-dioxin of less than 20 picograms per litre and the concentration of 2,3,7,8-tetrachlorodibenzofuran in a sample is non-measurable if analysis of the sample shows a concentration of 2,3,7,8-tetrachlorodibenzofuran of less than 50 picograms per litre.

(7) Each discharger shall control the quality of each process effluent monitoring stream at the discharger's plant to ensure that the total toxic equivalent concentration of 2,3,7,8 substituted dioxin and furan congeners in any sample collected at a process effluent sampling point at the plant, calculated in accordance with the methods described in the Ministry of Environment and Energy publication entitled "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater", dated July, 1993, does not exceed 60 picograms per litre.

(8) Subject to subsection (9), each discharger shall control the quality of each process effluent monitoring stream at the discharger's plant to ensure that the pH value of any sample collected at a process effluent sampling point at the plant is within the range of 6.0 to 9.5.

(9) Throughout any day on which a discharger has used an alternate sampling point on a process effluent monitoring stream for sampling required by section 22, as permitted by subsections 22(7) and (8), the discharger,

(a) shall control the quality of the stream to ensure that the pH value of any sample collected at the alternate sampling point on the stream is within the range of 6.0 to 9.5; and

(b) need not comply with subsection (8) with respect to the stream.

Revised Parameter Limits

15.-(1) Beginning on January 1, 1996, each discharger may annually calculate a revised daily plant loading limit and a revised monthly average plant loading limit for each limited parameter.

(2) Despite subsection (1), beginning on January 1, 1995, each discharger for which a limit for AOX is listed in Columns 3 and 4 of Schedule 2 may annually calculate a revised daily plant loading limit and a revised monthly average plant loading limit for AOX.

(3) Each discharger shall calculate, to three significant figures, a revised daily plant loading limit for a limited parameter by dividing the revised reference production rate of finished product at the discharger's plant as determined under subsection (4) by the reference production rate of finished product specified in Schedule 4 for the discharger's plant, and multiplying that ratio by the daily plant loading limit specified for the parameter and the plant in Column 3 of Schedule 2.

(4) For the purposes of subsection (3), the revised reference production rate of finished product at a discharger's plant is equal to the highest value of the ninetieth percentiles of the daily production of finished product at the plant for the three calendar years preceding the calendar year in which the revised limit is to come into force.

(5) To determine the highest value of the ninetieth percentiles of the daily production of finished product at the plant for the three calendar years, the discharger shall do the following:

1. Determine, in tonnes, the amount of dried finished product that was produced by the plant on each day that the plant operated in each of the three calendar years.

2. For each of the three calendar years, determine the statistically derived value that is equal to the amount of dried finished product, produced daily by the plant, that was exceeded on 10 per cent of the days that the plant operated in that calender year.

3. Take the highest of the values determined under step 2.

(6) The reference production rate and the revised reference production rate to be used for the purpose of calculating a revised daily plant loading limit for AOX are the rates of production of bleached pulp and, for the purpose, a reference in subsections (3) to (5) to finished product shall be deemed to be a reference to bleached pulp.

(7) For the purposes of subsection (3), the daily plant loading limit for AOX is the limit set out for the parameter and the plant in Column 3 of Schedule 2 that is in effect on the first day of January in the calendar year in which the revised limit is to come into force.

(8) If the revised daily plant loading limit calculated for a limited parameter under subsection (3) exceeds the daily plant loading limit specified for the parameter and the plant in Column 3 of Schedule 2 by no more than 15 per cent, the discharger may notify the Director in writing of the value of the revised limit and of the value of the revised reference production rate used for the purpose of calculating that limit.

(9) A notice under subsection (8) shall be given to the Director in writing on or before January 31 in the calendar year in which the revised limit is to come into force.

(10) Where a notice is given under subsection (8), the revised daily plant loading limit calculated for the limited parameter under subsection (3) shall be deemed to replace the daily plant loading limit specified for the parameter and the plant in Column 3 of Schedule 2.

(11) Despite subsection (10), the daily plant loading limit specified for a parameter and a plant in Column 3 of Schedule 2 shall always be used for the purpose of making a calculation under subsection (3) or for the purpose of making a determination under subsection (8) or (14).

(12) Where a notice is given under subsection (8) with respect to a limited parameter and a revised daily plant loading limit is already in force with respect to the limited parameter, the revised daily plant loading limit calculated for the limited parameter under subsection (3) shall be deemed to replace the revised daily plant loading limit that is currently in force.

(13) Subsections (3) to (12) apply with necessary modifications for the purpose of calculating and using a revised monthly average plant loading limit and, for the purpose, a reference in those subsections to a revised daily plant loading limit shall be deemed to be a reference to a revised monthly average plant loading limit, a reference to a daily plant loading limit shall be deemed to be a reference to a monthly average

plant loading limit, and a reference to Column 3 of Schedule 2 shall be deemed to be a reference to Column 4 of Schedule 2.

(14) If a revised limit calculated for a limited parameter under subsection (3) exceeds the applicable limit specified for the parameter and the plant in Column 3 or 4 of Schedule 2 by more than 15 per cent, the discharger may apply to the Director for approval to revise the limit.

(15) An application under subsection (14) shall be submitted together with the results of a receiving water assessment study that the discharger has prepared for the purpose of identifying what effect the proposed revised limit would have on the receiving water.

(16) The Director shall approve an application under subsection (14) if the Director is satisfied, based on the results of the receiving water assessment study, that the proposed revised limit would not have an adverse effect on the receiving water.

(17) Despite subsections (10), (12) and (16), a revised limit that is in force with respect to AOX expires,

(a) on January 31, 1996, if a phase-one limit is used for the purpose of the calculation of the revised limit;

(b) on January 31, 2000, if a phase-two limit is used for the purpose of the calculation of the revised limit.

(18) Nothing in this section shall be interpreted to relieve a discharger of the obligation to apply for any certificate of approval that may be required under the Ontario Water Resources Act or the Environmental Protection Act.

Lethality Limits

16. Each discharger shall control the quality of each process effluent monitoring stream and each cooling water effluent monitoring stream at the discharger's plant to ensure that each rainbow trout acute lethality test and each *Daphnia magna* acute lethality test performed on any grab sample collected at a process effluent sampling point or cooling water effluent sampling point at the plant results in mortality for no more than 50 per cent of the test organisms in 100 per cent effluent.

PART V

MONITORING

Monitoring - General

17.-(1) Despite sections 18 to 26, a discharger need not collect samples from any stream at the discharger's plant on a day on which there is no process effluent that is being discharged from the plant.

(2) Where a discharger is required by this Regulation to pick up a set of samples and analyze it for certain parameters the discharger shall pick up a set of samples sufficient to allow all the analyses to be performed.

(3) A discharger shall use all reasonable efforts to ensure that all analyses required by this Regulation are completed as soon as reasonably possible and that the results of those analyses are made available to the discharger as soon as reasonably possible.

(4) Subject to subsection (5), each discharger shall pick up all sets of samples required to be picked up at the discharger's plant under sections 18, 19 and 20 between the hours of 7 a.m. and 10 a.m..

(5) If the Director is satisfied, on the basis of written submissions from a discharger, that the circumstances at the discharger's plant are such that it would be impractical to pick up a set of samples from each sampling point established at the plant under this Regulation within the time period specified in subsection (4), the Director may give the discharger a written notice in respect of the plant, varying the time period specified in subsection (4).

(6) Subject to subsections (7) and (8), where a discharger is required by section 18, 19 or 20 to pick up a set of samples the discharger shall pick up a set collected over the twenty-four hour period immediately preceding the pick-up.

(7) The twenty-four hour period referred to in subsection (6) may be shortened or enlarged by up to three hours to permit a discharger to take advantage of the three hour range specified in subsection (4) or of a different three hour period specified in a notice under subsection (5).

(8) Where a notice has been given under subsection (5) in respect of a plant specifying a time period longer than three hours, the twenty-four hour period referred to in subsection (6) may be shortened or enlarged by up to that longer amount of time

to permit the discharger to take advantage of the time period specified in the notice.

(9) If the circumstances at a plant change so that the Director is satisfied that the circumstances described in subsection (5) no longer apply at the plant, the Director may revoke a notice given in respect of a plant under subsection (5) by giving a notice of revocation in writing to a discharger for the plant.

Monitoring - Process Effluent - Daily

18.-(1) Each discharger shall, on each day, pick up a set of samples collected at each process effluent sampling point at the discharger's plant and shall analyze each set of samples for the parameters for which the frequency of monitoring, as set out in Column 2 of Schedule 2 for the discharger's plant, is daily.

(2) A discharger need not meet the requirements of subsection (1) where it is impossible to do so because of sampling by a provincial officer.

Monitoring - Process Effluent - Weekly

19.-(1) Each discharger shall, on one day in each week, pick up a set of samples collected at each process effluent sampling point at the discharger's plant and shall analyze each set of samples for the parameters for which the frequency of monitoring, as set out in Column 2 of Schedule 2 for the discharger's plant, is weekly.

(2) There shall be an interval of at least four days between successive pick-up days at the plant under subsection (1).

(3) All samples picked up under subsection (1) in a week shall be picked up on the same day in the week.

Monitoring - Process Effluent - Quarterly

20.-(1) Each discharger shall, on one day in each quarter, pick up a set of samples collected at each process effluent sampling point at the discharger's plant and shall analyze each set of samples for the parameters for which the frequency of monitoring, as set out in Column 2 of Schedule 2 for the discharger's plant, is quarterly.

(2) There shall be an interval of at least forty-five days between successive pick-up days at the plant under subsection (1).

(3) All samples picked up under subsection (1) in a quarter shall be picked up on the same day in the quarter.

Monitoring - Process Effluent - Quality Control

21.-(1) On one day in each year after 1993, on a day on which samples are picked up at the plant under subsection 19(1), each discharger shall collect and pick up a duplicate sample for each sample picked up on that day under subsection 19(1) at one process effluent sampling point at the discharger's plant and shall analyze each duplicate sample for the parameters for which the frequency of monitoring, as set out in Column 2 of Schedule 2 for the discharger's plant, is weekly.

(2) Each discharger shall prepare a travelling blank and travelling spiked blank sample for each sample for which a duplicate sample is picked up at the plant under subsection (1) and shall analyze the travelling blank and travelling spiked blank samples in accordance with the directions set out in the Ministry of Environment and Energy publication entitled "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater", dated July, 1993.

(3) There shall be an interval of at least six months between successive pick-up days at the plant under subsection (1).

Monitoring - Process Effluent - pH Measurement

22.-(1) Each discharger shall, on each day during the time period applicable to the plant under subsection 17(4) or (5), collect a grab sample from each process effluent monitoring stream at the discharger's plant and shall analyze each sample for the parameter pH.

(2) Each discharger shall, within each twenty-four hour period beginning with the collection of the first grab sample at the plant under subsection (1) on each day, collect two more grab samples from each process effluent monitoring stream at the discharger's plant and shall analyze each sample for the parameter pH.

(3) There shall be an interval of at least four hours between each of the three collections at a stream under subsections (1) and (2) in each twenty-four hour period.

(4) Each grab sample collected under subsections (1) and (2) shall be picked up within twenty-four hours of when it was collected.

(3) All samples picked up under subsection (1) in a quarter shall be picked up on the same day in the quarter.

Monitoring - Process Effluent - Quality Control

21.-(1) On one day in each year after 1993, on a day on which samples are picked up at the plant under subsection 19(1), each discharger shall collect and pick up a duplicate sample for each sample picked up on that day under subsection 19(1) at one process effluent sampling point at the discharger's plant and shall analyze each duplicate sample for the parameters for which the frequency of monitoring, as set out in Column 2 of Schedule 2 for the discharger's plant, is weekly.

(2) Each discharger shall prepare a travelling blank and travelling spiked blank sample for each sample for which a duplicate sample is picked up at the plant under subsection (1) and shall analyze the travelling blank and travelling spiked blank samples in accordance with the directions set out in the Ministry of Environment and Energy publication entitled "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater", dated July, 1993.

(3) There shall be an interval of at least six months between successive pick-up days at the plant under subsection (1).

Monitoring - Process Effluent - pH Measurement

22.-(1) Each discharger shall, on each day during the time period applicable to the plant under subsection 17(4) or (5), collect a grab sample from each process effluent monitoring stream at the discharger's plant and shall analyze each sample for the parameter pH.

(2) Each discharger shall, within each twenty-four hour period beginning with the collection of the first grab sample at the plant under subsection (1) on each day, collect two more grab samples from each process effluent monitoring stream at the discharger's plant and shall analyze each sample for the parameter pH.

(3) There shall be an interval of at least four hours between each of the three collections at a stream under subsections (1) and (2) in each twenty-four hour period.

(4) Each grab sample collected under subsections (1) and (2) shall be picked up within twenty-four hours of when it was collected.

(5) Instead of complying with subsections (1) to (4) with respect to a stream, a discharger may use an on-line analyzer at the sampling point on the stream and analyze the effluent at the sampling point for the parameter pH once in each day during the time period applicable to the plant under subsection 17(4) or (5), and two more times in each twenty-four hour period beginning with the first analysis at the plant under this subsection in each day.

(6) There shall be an interval of at least four hours between each of the three analyses at a sampling point under subsection (5) in each twenty-four hour period.

(7) For the purposes of this section, a discharger shall use either the sampling point established under section 8 on the stream or an alternate sampling point located downstream of the sampling point but before the point of discharge of the stream to surface water or to an industrial sewer used in common with another plant.

(8) Before using an alternate sampling point under subsection (7), a discharger shall give the Director a written notice describing the location of the alternate sampling point, together with a revised version of the list and plot plan submitted under section 9 showing the alternate sampling point.

Monitoring - Acute Lethality Testing - Rainbow Trout

23.-(1) Where a discharger is required by this section to perform a rainbow trout acute lethality test, the discharger shall perform the test according to the procedures described in the Environment Canada publication entitled "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout", dated July, 1990.

(2) Each rainbow trout acute lethality test required by this section shall be carried out as a single concentration test using 100 per cent effluent.

(3) On one day in each month, on a day on which samples are picked up at the plant under subsection 19(1), each discharger shall collect and immediately pick up a grab sample at each process effluent sampling point at the discharger's plant and shall perform a rainbow trout acute lethality test on each sample.

(4) There shall be an interval of at least fifteen days between successive pick-up days at the plant under subsection (3).

(5) All samples picked up under subsection (3) in a month shall be picked up on the same day in the month.

(6) Where a discharger has performed tests under subsection (3) for twelve consecutive months on samples collected from the same sampling point and the mortality of the rainbow trout in each test did not exceed 50 per cent, the discharger is relieved of the obligations under subsection (3) relating to the sampling point and shall instead collect and immediately pick up a grab sample at the sampling point on one day in each quarter and perform a rainbow trout acute lethality test on each sample.

(7) Samples picked up at a plant under subsection (6) shall be picked up on a day on which samples are picked up at the plant under subsection (3).

(8) If no samples are being picked up at a plant under subsection (3) during a quarter, samples picked up at the plant during the quarter under subsection (6) shall be picked up on a day on which samples are picked up at the plant under subsection 19(1).

(9) There shall be an interval of at least forty-five days between successive pick-up days at the plant under subsection (6).

(10) All samples picked up under subsection (6) in a quarter shall be picked up on the same day in the quarter.

(11) If a rainbow trout acute lethality test performed under subsection (6) on any sample from a sampling point results in mortality of more than 50 per cent of the test rainbow trout, subsections (6) to (10) cease to apply in respect to samples from that sampling point, and a discharger shall instead comply with the requirements of subsection (3) relating to the sampling point, until the tests performed under subsection (3) on all samples collected from the sampling point for a further twelve consecutive months result in mortality for no more than 50 per cent of the rainbow trout for each test.

(12) A discharger shall notify the Director in writing of any change in the frequency of acute lethality testing under this Regulation at the discharger's plant, within thirty days after the day on which the change begins.

(13) A discharger may notify the Director in writing of any period in which the testing of samples collected at a sampling point under subsection (3) would always result in mortality of more than 50 per cent of the test rainbow trout.

(14) Where a notice is given under subsection (13), a discharger is relieved of the obligations under subsection (3)

relating to the sampling point during the period in which the testing of samples collected at the sampling point would always result in mortality of more than 50 per cent of the test rainbow trout.

(15) Subsections (13) and (14) are revoked on January 1, 1996.

(16) Subsections (2) to (15) apply with necessary modifications to each cooling water effluent sampling point and, for the purpose, the reference in subsection (3) to each process effluent sampling point shall be deemed to be a reference to each cooling water effluent sampling point and the reference in subsections (3) and (8) to subsection 19(1) shall be deemed to be a reference to subsection 26(1).

Monitoring - Acute Lethality Testing - Daphnia magna

24.-(1) Where a discharger is required by this section to perform a Daphnia magna acute lethality test, the discharger shall perform the test according to the procedures described in the Environment Canada publication entitled "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna", dated July, 1990.

(2) Subsections 23(2) to (16) apply with necessary modifications to Daphnia magna acute lethality tests and, for the purpose, a reference to rainbow trout shall be deemed to be a reference to Daphnia magna.

(3) Each discharger shall pick up each set of samples required to be collected from a sampling point at the discharger's plant under this section on a day on which the discharger collects a sample from the sampling point under section 23, to the extent possible having regard to the frequency of monitoring required at the sampling point under this section and section 23.

Monitoring - Chronic Toxicity Testing - Fathead Minnow and Ceriodaphnia Dubia

25.-(1) Where a discharger is required to perform a 7-day fathead minnow growth inhibition test, the discharger shall perform the test according to the procedure described in the Environment Canada publication entitled "Biological Test Method: Test of Larval Growth and Survival Using Fathead Minnows" dated February, 1992.

(2) Where a discharger is required to perform a 7-day Ceriodaphnia dubia reproduction inhibition and survivability

test, the discharger shall perform the test according to the procedure described in the Environment Canada publication entitled "Biological Test Method: Test of Reproduction and Survival Using the Cladoceran Ceriodaphnia dubia", dated February, 1992.

(3) On one day in each semi-annual period, on a day on which samples are picked up at the plant under subsection 19(1), each discharger shall collect and immediately pick up a grab sample from each process effluent sampling point at the discharger's plant, and shall perform a 7-day fathead minnow growth inhibition test and a 7-day Ceriodaphnia dubia reproduction inhibition and survivability test on each sample.

(4) There shall be an interval of at least ninety days between successive pick-up days at the plant under subsection (3).

(5) All samples picked up under subsection (3) in a semi-annual period shall be picked up on the same day in the semi-annual period.

(6) A discharger need not collect a sample from a sampling point in accordance with subsection (3) until twelve consecutive monthly rainbow trout acute lethality tests and twelve consecutive monthly Daphnia magna acute lethality tests performed on samples collected at the sampling point at a discharger's plant result in mortality for no more than 50 per cent of the test organisms in 100 per cent effluent.

Monitoring - Cooling Water Effluent - Weekly Assessment

26.-(1) Each discharger shall, on one day in each week, pick up a set of samples collected at each cooling water effluent sampling point at the discharger's plant and shall analyze each set of samples for each assessment parameter.

(2) There shall be an interval of at least four days between successive pick-up days at the plant under subsection (1).

(3) All samples picked up under subsection (1) in a week shall be picked up on the same day in the week.

PART VI

EFFLUENT VOLUME

Flow Measurement

27.-(1) For the purposes of this section, a volume of effluent for a stream for a day is the volume that flowed past the sampling point established under Part II on the stream during the twenty-four hour period preceding the pick-up of the first sample picked up from the stream for the day.

(2) Each discharger shall determine in cubic metres a daily volume of effluent for each process effluent stream at the discharger's plant for each day on which a sample is collected under this Regulation from the stream, by integration of continuous flowrate measurements.

(3) Despite subsection (2), where a process effluent stream discharges on an intermittent basis, the daily volumes for the stream may be determined either by integration of continuous flowrate measurements or by the summation of individual batch volume measurements.

(4) Each discharger shall use flow measurement methods that allow the daily volumes for process effluent streams to be determined to an accuracy of within plus or minus 15 per cent.

(5) Each discharger shall determine in cubic metres a daily volume of effluent for each cooling water effluent stream at the discharger's plant for each day on which a sample is collected under this Regulation from the stream.

(6) Each discharger shall use flow measurement methods that allow the daily volumes for cooling water effluent streams to be determined to an accuracy of within plus or minus 20 per cent.

(7) Each discharger shall, no later than the day that this section comes into force, determine by calibration or confirm by means of a certified report of a registered professional engineer of the Province of Ontario that each flow measurement method used under subsections (2) and (3) meets the accuracy requirements of subsection (4) and that each flow measurement method used under subsection (5) meets the accuracy requirements of subsection (6).

(8) Where a discharger uses a new flow measurement method or alters an existing flow measurement method, the discharger shall determine by calibration or confirm by means of a certified report of a registered professional engineer of the Province of Ontario that each new or altered flow measurement method meets the accuracy requirements of subsections (4) or (6), as the case

may be, within two weeks after the day on which the new or altered method or system is used.

(9) Each discharger shall develop and implement a maintenance schedule and a calibration schedule for each flow measurement system installed at the discharger's plant and shall maintain each flow measurement system according to good operating practices.

(10) Each discharger shall use reasonable efforts to set up each flow measurement system used for the purposes of this section in a way that permits inspection by a provincial officer.

Calculation of Plant Volumes

28.-(1) Each discharger shall calculate, in cubic metres, a daily process effluent plant volume for each day.

(2) For the purposes of subsection (1), a process effluent plant volume for a day is the sum of the daily process effluent volumes determined under section 27 for the day.

(3) Each discharger shall calculate, in cubic metres, a monthly average process effluent plant volume for each month, by taking the arithmetic mean of the daily process effluent plant volumes calculated under subsection (1) for the month.

(4) Each discharger shall calculate, in cubic metres, a daily cooling water effluent plant volume for each day.

(5) For the purposes of subsection (4), a cooling water effluent plant volume for a day is the sum of the daily cooling water volumes determined under section 27 for the day.

(6) Each discharger shall calculate, in cubic metres, a monthly average cooling water effluent plant volume for each month, by taking the arithmetic mean of the daily cooling water effluent plant volumes calculated under subsection (4) for the month.

PART VII

STORM WATER CONTROL STUDY

Storm Water Control Study

29.-(1) Each discharger shall complete a storm water control study in respect of the discharger's plant, in accordance with the requirements of the Ministry of Environment and Energy publication entitled "Protocol for Conducting a Storm Water Control Study", dated August, 1993.

(2) A discharger need not comply with subsection (1) in respect of the discharger's plant if,

(a) the plant meets the exemption criteria set out in the Ministry of Environment and Energy publication entitled "Protocol for Conducting a Storm Water Control Study," dated August, 1993; and

(b) the discharger notifies the Director in writing, by November 25, 1994, that the plant meets the exemption criteria referred to in clause (a).

(3) Subject to subsection (4), a discharger shall complete the storm water control study in respect of the discharger's plant by November 27, 1995.

(4) A discharger may postpone completion of the storm water control study in respect of the discharger's plant until January 1, 1997 if,

(a) in order to meet the requirements of Part IV, the discharger plans to make process changes, install waste water treatment facilities, implement management practices, or make any other changes at the plant that would likely alter the quantity or quality of storm water discharged from the plant; and

(b) the discharger notifies the Director in writing, by November 27, 1995, of the plans referred to in clause (a).

(5) Each discharger shall ensure that a copy of each study completed under this section is available to Ministry staff at the discharger's plant, on request during the plant's normal office hours.

PART VIII
RECORDS AND REPORTS

Record Keeping

30.-(1) Each discharger shall keep records, in an electronic format acceptable to the Director, of all analytical results obtained under sections 18, 19, 20, 22 and 26, all calculations performed under sections 12 and 13 and all determinations and calculations made or performed under sections 27 and 28.

(2) Each discharger shall keep records of all sampling and analytical procedures used in meeting the requirements of section 7, including, for each sample, the date, the time of pick-up, the sampling procedures used, and any incidents likely to affect the analytical results.

(3) Each discharger shall keep records of all calculations performed under section 15.

(4) Each discharger shall keep records of the results of all monitoring performed under sections 21 and 23 to 25.

(5) Each discharger shall keep records of all maintenance and calibration procedures performed under section 27.

(6) Each discharger shall keep records of all problems or malfunctions, including those related to sampling, analysis, acute lethality testing, chronic toxicity testing or flow measurement, that result or are likely to result in a failure to comply with a requirement of this Regulation, stating the date, duration and cause of each malfunction, and including a description of any remedial action taken.

(7) Each discharger shall keep records of any incident in which process effluent is discharged from the discharger's plant without flowing past a sampling point established on a process effluent stream in accordance with this Regulation before being discharged, stating the date, duration, cause and nature of each incident.

(8) Each discharger shall keep records of all process changes and redirections of or changes in the character of effluent streams that affect the quality of effluent at any sampling point established under this Regulation at the discharger's plant.

(9) Each discharger shall keep records of the amount of dried finished product, calculated in tonnes, that is produced daily at the discharger's plant.

(10) Each discharger for which a limit for AOX is listed in Columns 3 and 4 of Schedule 2 shall keep records of the amount of dried bleached pulp, calculated in tonnes, that is produced daily at the discharger's plant.

(11) Each discharger shall keep records of the location of each sampling point established at the discharger's plant under Part II.

(12) Each discharger shall make each record required by this section as soon as reasonably possible and shall keep each such record for a period of three years.

(13) Each discharger shall ensure that all records kept under this section are available to Ministry staff at the discharger's plant, on request during the plant's normal office hours.

Reports Available to the Public

31.-(1) On or before June 1 in each year, each discharger shall prepare a report relating to the previous calendar year and including,

(a) a summary of plant loadings calculated under sections 12 and 13;

(b) a summary of the results of monitoring performed under sections 18, 19, 20 and 22 to 26;

(c) a summary of calculations performed under subsections 28(1) and (4);

(d) the value of any revised limits calculated under section 15;

(e) a summary of the loadings, concentrations or other results that exceeded a limit under section 14, 15 or 16; and

(f) a summary of the incidents in which process effluent was discharged from the discharger's plant without flowing past a sampling point established on a process effluent stream in accordance with this Regulation before being discharged.

(2) Each discharger shall ensure that each report prepared under subsection (1) is available to any person at the discharger's plant, on request during the plant's normal office hours.

(3) Each discharger shall provide the Director, upon request, with a copy of any report that the discharger has prepared under subsection (1).

Reports to the Director - General

32.-(1) Each discharger shall notify the Director in writing of any change of name or ownership of the discharger's plant occurring after November 25, 1993, within thirty days after the end of the month in which the change occurs.

(2) Each discharger shall notify the Director in writing of any process change or redirection of or change in the character of an effluent stream that affects the quality of effluent at any sampling point established under this Regulation at the discharger's plant, within thirty days of the change or redirection.

(3) A discharger need not comply with subsection (2) where the effect of the change or redirection on effluent quality is of less than one week's duration.

(4) Each discharger shall notify the Director in writing if the discharger's plant has, for more than ninety consecutive days, operated at less than 75 per cent of the reference production rate specified in Schedule 4 for finished product at the discharger's plant, within thirty days of the end of the ninety day period.

(5) Each discharger for which a limit for AOX is listed in Columns 3 and 4 of Schedule 2 shall notify the Director in writing if the discharger's plant has, for more than ninety consecutive days, operated at less than 75 per cent of the reference production rate specified in Schedule 4 for bleached pulp at the discharger's plant, within thirty days of the end of the ninety day period.

Reports to the Director on Compliance with Section 6 and Part IV

33.-(1) Each discharger shall report to the Director any incident in which process effluent is discharged from the discharger's plant without flowing past a sampling point established on a process effluent stream in accordance with this Regulation before being discharged.

(2) Each discharger shall report to the Director any loading, concentration or other result that exceeds a limit under section 14, 15 or 16.

(3) A report required under subsection (1) or (2) shall be given orally, as soon as reasonably possible, and in writing, as soon as reasonably possible.

Quarterly Reports to the Director

34.-(1) No later than forty-five days after the end of each quarter, each discharger shall submit a report to the Director containing information relating to the discharger's plant throughout the quarter as required by subsections (3) to (8).

(2) A report under this section shall be submitted both in an electronic format acceptable to the Director and in hard copy generated from the electronic format and signed by the discharger.

(3) A report under this section shall include all information included in a report given under section 33 during the quarter.

(4) Each discharger shall report, for each month in the quarter, the monthly average plant loadings and the highest and lowest daily plant loadings calculated under section 12 and 13 for each limited parameter and each assessment parameter.

(5) Each discharger shall report, for each month in the quarter, the monthly average process effluent plant volume and the highest and lowest daily process effluent plant volumes calculated under section 28.

(6) Each discharger shall report, for each month in the quarter, the monthly average cooling water effluent plant volume and the highest and lowest daily cooling water effluent plant volumes calculated under section 28.

(7) Each discharger shall report the number of days in each month in the quarter on which process effluent was discharged from the discharger's plant.

(8) Each discharger shall report, for each month in the quarter, the highest and lowest pH results obtained under section 22 for each process effluent monitoring stream at the discharger's plant.

Reports to the Director on Chronic Toxicity Testing

35.-(1) Each discharger shall report to the Director the results of all monitoring performed under section 25, together with the date on which each sample was picked up, no later than sixty days after the end of each semi-annual period in which the monitoring was performed.

(2) A report under subsection (1) shall include a plot of percentage reduction in growth or reproduction against the logarithm of test concentration and shall include a calculation of the concentration at which a 25 per cent reduction in growth or reproduction would occur.

AOX Progress Reports

36.-(1) On or before December 31, 1994, each discharger for which a limit for AOX is listed in Columns 3 and 4 of Schedule 2 shall submit a report to the Director outlining the steps taken at the discharger's plant to meet, on or before December 31, 1995, the phase-two limits that are specified for the parameter and the plant in Columns 3 and 4 of Schedule 2.

(2) On or before December 31 in each of the years 1996, 1997 and 1998, each discharger for which a limit for AOX is listed in Columns 3 and 4 of Schedule 2 shall submit a report to the Director outlining the steps taken at the discharger's plant to meet, on or before December 31, 1999, the phase-three limits that are specified for the parameter and the plant in Columns 3 and 4 of Schedule 2.

(3) A discharger is not required to submit a report under this section if the discharger has met the AOX limit that is the subject of the report for a period of twelve months preceding the date on which the discharger is required to submit the report.

AOX Elimination Reports

37.-(1) On or before May 25, 1994, each discharger for which a limit for AOX is listed in Columns 3 and 4 of Schedule 2 shall submit a report to the Director that sets out the following information:

1. An outline of the methods by which AOX generated from the bleaching of pulp at the discharger's plant could be eliminated by the year 2002.

2. The timetable that would be required to implement each method identified under paragraph 1 and each

of the stages involved in the implementation of each method.

3. An estimate of the financial cost to the discharger of implementing each method identified under paragraph 1.

(2) On or before January 31, 1996, each discharger for which a limit for AOX is listed in Columns 3 and 4 of Schedule 2 shall submit a report to the Director that sets out the following information:

1. A detailed description of the methods by which AOX generated from the bleaching of pulp at the discharger's plant could be eliminated by the year 2002.

2. The timetable that would be required to implement each method described under paragraph 1 and each of the stages involved in the implementation of each method.

3. An estimate of the financial cost to the discharger of implementing each method described under paragraph 1.

4. A strategy that could be used at the discharger's plant for informing the discharger's employees about the methods by which AOX generated from the bleaching of pulp at the discharger's plant could be eliminated.

5. A list of any short-term or long-term goals that the discharger has developed in respect of reducing or eliminating the generation of AOX at the discharger's plant.

6. An up-to-date description and diagram of where, within the discharger's bleaching processes and operations, AOX is generated at the discharger's plant.

7. The amounts of chlorine and chlorine compounds that were used during 1995 at the discharger's plant for the purpose of bleaching pulp.

(3) On or before January 31, 1999, each discharger for which a limit for AOX is listed in Columns 3 and 4 of Schedule 2 shall submit a report to the Director that sets out the following information:

1. A detailed description of any additional methods to those described under paragraph 1 of subsection (2), by which AOX generated from the bleaching of pulp at the discharger's plant could be eliminated by the year 2002.

2. An evaluation of the technical feasibility of implementing at the discharger's plant each method described under paragraph 1 of subsection (2) and paragraph 1 of this subsection, and an identification of which methods are technically feasible.

3. The timetable that would be required to implement each method identified as technically feasible under paragraph 2 and each of the stages involved in the implementation of each method.

4. An estimate of the financial cost to the discharger of implementing each method identified as technically feasible under paragraph 2.

5. An estimate of the reduction in the generation of AOX that could be anticipated in respect of the discharger's plant as a result of the implementation of each method identified as technically feasible under paragraph 2.

6. A list of any additional short-term and long-term goals to those listed under paragraph 5 of subsection (2), that the discharger has developed in respect of reducing or eliminating the generation of AOX at the discharger's plant.

7. An up-to-date description and diagram of where, within the discharger's bleaching processes and operations, AOX is generated at the discharger's plant.

8. The amounts of chlorine and chlorine compounds that were used during each of the years 1996, 1997 and 1998 at the discharger's plant for the purpose of bleaching pulp.

(4) On or before January 31 in each of the years 2000 and 2001, each discharger for which a limit for AOX is listed in Columns 3 and 4 of Schedule 2 shall submit a report to the Director that sets out the following information:

1. A detailed description of any additional methods to those described in any previous report prepared under this section, by which AOX generated from the

bleaching of pulp at the discharger's plant could be eliminated by the year 2002.

2. An evaluation of the technical feasibility of implementing at the discharger's plant each additional method described under paragraph 1, and an identification of which methods are technically feasible.

3. The timetable that would be required to implement each method identified as technically feasible under paragraph 2 and each of the stages involved in the implementation of each method.

4. An estimate of the financial cost to the discharger of implementing each method identified as technically feasible under paragraph 2.

5. A re-evaluation, where necessary, of the technical feasibility of implementing at the discharger's plant any method identified as technically feasible in any previous report prepared under this section, and a description of the factors that have contributed to the need for the re-evaluation.

6. The amount of AOX that was generated at the discharger's plant during the previous calendar year, and the manner in which that amount was calculated.

(5) In describing, for the purposes of a report prepared under this section, the methods by which AOX generated from the bleaching of pulp at the discharger's plant could be eliminated by the year 2002, the discharger shall consider,

(a) any methods that substitute other chemical or biochemical agents for chlorine and chlorine compounds for the purpose of bleaching pulp; and

(b) how products that are produced at the discharger's plant could be redesigned so as to eliminate the need for the use of chlorine or chlorine compounds in the discharger's bleaching processes and operations.

Review of AOX Reports

38. A report submitted under section 37 shall be reviewed by the Ministry in relation to its goal of eliminating the generation of AOX at dischargers' plants by the year 2002, taking

into account any relevant environmental, technological and economic considerations.

PART IX

COMMENCEMENT AND REVOCATION PROVISIONS

Revocation of Ontario Regulation 435/89

39. Ontario Regulations 435/89 and 202/90 are revoked on February 23, 1994.

Commencement of Parts IV, V and VI

40.-(1) Subject to subsection (2), Part IV comes into force on January 1, 1996.

(2) Subsections 14(2) and (4) and section 15 come into force on the date of filing.

(3) Parts V and VI come into force on February 23, 1994.

Schedule 1

LIST OF REGULATED PLANTS

Plant	Location	Owner as of September, 1993
Abitibi-Price Inc., Fort William Division	Thunder Bay	Abitibi-Price Inc.
Abitibi-Price Inc., Iroquois Falls Division	Iroquois Falls	Abitibi Price Inc.
Abitibi-Price Inc., Provincial Papers Division	Thunder Bay	Abitibi Price Inc.
Beaver Wood Fibre Company Ltd.	Thorold	Beaver Wood Fibre Company Ltd.
Boise Cascade Canada Ltd., Fort Frances	Fort Frances	Boise Cascade Canada Ltd.
Boise Cascade Canada Ltd., Kenora	Kenora	Boise Cascade Canada Ltd.
Canadian Pacific Forest Products, Dryden	Dryden	Canadian Pacific Forest Products Limited
Canadian Pacific Forest Products, Thunder Bay	Thunder Bay	Canadian Pacific Forest Products Limited
Domtar Inc., Containerboard Division, Red Rock	Red Rock	Domtar Inc.
Domtar Inc., Containerboard Division, Trenton	Trenton	Domtar Inc.
Domtar Inc., Fine Papers Division, Cornwall	Cornwall	Domtar Inc.
Domtar Inc., Fine Papers Division, St. Catharines	St. Catharines	Domtar Inc.
E.B. Eddy Forest Products Ltd., Espanola	Espanola	E.B. Eddy Forest Products Ltd.
E.B. Eddy Forest Products Ltd., Ottawa	Ottawa	E.B. Eddy Forest Products Ltd.
James River-Marathon Ltd.	Marathon	James River-Marathon Ltd.
Kimberly-Clark Canada Inc., Huntsville	Huntsville	Kimberly Clark of Canada Inc.
Kimberly-Clark Canada Inc., St. Catharines	St. Catharines	Kimberly Clark of Canada Inc.
Kimberly-Clark Canada Inc., Terrace Bay	Terrace Bay	Kimberly Clark of Canada Inc.
MacMillan Bloedel Ltd.	Sturgeon Falls	MacMillan Bloedel Ltd.
Malette Kraft Pulp and Power Company	Smooth Rock Falls	Malette Inc.
Noranda Forest Products Inc., Recycled Papers	Thorold	Noranda Forest Inc.
QUNO Inc.	Thorold	QUNO Inc.
St. Marys Paper Inc.	Sault Ste. Marie	St. Marys Paper Inc.
Sonoco Limited	Trenton	Sonoco Limited
Spruce Falls Inc.	Kapuskasing	Spruce Falls Inc.
Strathcona Paper Company	Napanee	Roman Corporation Ltd.

Schedule 2

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Abitibi-Price Inc., Fort William Division

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	4280	2140
6	Total Phosphorus	W	120	72.8
8	Total Suspended Solids (TSS)	D	5740	3370
16	Chloroform	W	1.59	0.805
17	Toluene	W	0.0920	0.0920
20	Phenol	W	0.177	0.177
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Abitibi-Price Inc., Iroquois Falls Division

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit	Monthly Average Plant Loading Limit
			kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	9060	4530
6	Total Phosphorus	W	254	154
8	Total Suspended Solids (TSS)	D	12100	7130
16	Chloroform	W	3.37	1.70
17	Toluene	W	0.195	0.195
20	Phenol	W	0.374	0.374
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
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TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Abitibi-Price Inc., Provincial Papers Division

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	4890	2450
6	Total Phosphorus	W	137	83.1
8	Total Suspended Solids (TSS)	D	6550	3850
16	Chloroform	W	1.82	0.919
17	Toluene	W	0.105	0.105
20	Phenol	W	0.202	0.202
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
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TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Beaver Wood Fibre Company Ltd.

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit	Monthly Average Plant Loading Limit
			kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	2030	1010
6	Total Phosphorus	W	56.6	34.4
8	Total Suspended Solids (TSS)	D	2690	1590
16	Chloroform	W	0.753	0.378
17	Toluene	W	0.0746	0.0746
20	Phenol	W	0.0833	0.0833
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: **Boise Cascade Canada Ltd., Fort Frances**

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	11500	5760
6	Total Phosphorus	W	322	196
8	Total Suspended Solids (TSS)	D	15400	9060
16	Chloroform	W	4.28	2.16
17	Toluene	W	0.247	0.247
20	Phenol	W	0.475	0.475
33	Adsorbable Organic Halide - Phase-one	W	1970	1530
	- Phase-two	W	1180	917
	- Phase-three	W	629	489
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: **Boise Cascade Canada Ltd., Kenora**

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit	Monthly Average Plant Loading Limit
			kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	10600	5290
6	Total Phosphorus	W	296	180
8	Total Suspended Solids (TSS)	D	14200	8320
16	Chloroform	W	3.93	1.99
17	Toluene	W	0.227	0.227
20	Phenol	W	0.437	0.437
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Canadian Pacific Forest Products, Dryden				
ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit	Monthly Average Plant Loading Limit
			kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	14900	7470
6	Total Phosphorus	W	418	254
8	Total Suspended Solids (TSS)	D	20000	11700
16	Chloroform	W	5.55	2.81
17	Toluene	W	0.321	0.321
20	Phenol	W	0.617	0.617
33	Adsorbable Organic Halide - Phase-one	W	3030	2350
	- Phase-two	W	1810	1410
	- Phase-three	W	968	752
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Canadian Pacific Forest Products, Thunder Bay

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	28400	14200
6	Total Phosphorus	W	796	483
8	Total Suspended Solids (TSS)	D	38100	22400
16	Chloroform	W	10.6	5.34
17	Toluene	W	0.611	0.611
20	Phenol	W	1.17	1.17
33	Adsorbable Organic Halide - Phase-one	W	4670	3620
	- Phase-two	W	2800	2170
	- Phase-three	W	1490	1160
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Domtar Inc., Containerboard Division, Red Rock

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit	Monthly Average Plant Loading Limit
			kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	9760	4880
6	Total Phosphorus	W	273	166
8	Total Suspended Solids (TSS)	D	13100	7680
16	Chloroform	W	3.63	1.83
17	Toluene	W	0.210	0.210
20	Phenol	W	0.403	0.403
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Domtar Inc., Containerboard Division, Trenton

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit	Monthly Average Plant Loading Limit
			kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	2490	1240
6	Total Phosphorus	W	69.6	42.3
8	Total Suspended Solids (TSS)	D	3310	1950
16	Chloroform	W	0.927	0.465
17	Toluene	W	0.0918	0.0918
20	Phenol	W	0.102	0.102
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Domtar Inc., Fine Papers Division, Cornwall

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	8460	4230
6	Total Phosphorus	W	237	144
8	Total Suspended Solids (TSS)	D	11300	6660
16	Chloroform	W	3.15	1.59
17	Toluene	W	0.182	0.182
20	Phenol	W	0.349	0.349
33	Adsorbable Organic Halide - Phase-one	W	1510	1170
	- Phase-two	W	905	704
	- Phase-three	W	483	375
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Domtar Inc., Fine Papers Division, St. Catharines				
ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit	Monthly Average Plant Loading Limit
			kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	1140	570
6	Total Phosphorus	W	31.9	19.4
8	Total Suspended Solids (TSS)	D	1520	896
16	Chloroform	W	0.425	0.214
17	Toluene	W	0.0421	0.0421
20	Phenol	W	0.0470	0.0470
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: E.B. Eddy Forest Products Ltd., Espanola

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	12200	6080
6	Total Phosphorus	W	340	207
8	Total Suspended Solids (TSS)	D	16300	9570
16	Chloroform	W	4.52	2.29
17	Toluene	W	0.261	0.261
20	Phenol	W	0.502	0.502
33	Adsorbable Organic Halide - Phase-one	W	3920	3040
	- Phase-two	W	2350	1820
	- Phase-three	W	1250	973
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: E.B. Eddy Forest Products Ltd., Ottawa				
ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	1050	521
6	Total Phosphorus	W	29.2	17.7
8	Total Suspended Solids (TSS)	D	1390	818
16	Chloroform	W	0.388	0.195
17	Toluene	W	0.0385	0.0385
20	Phenol	W	0.0430	0.0430
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: James River-Marathon Ltd.

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit (kg/day)	Monthly Average Plant Loading Limit (kg/day)
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	5330	2670
6	Total Phosphorus	W	149	90.6
8	Total Suspended Solids (TSS)	D	7140	4190
16	Chloroform	W	1.98	1.00
17	Toluene	W	0.115	0.115
20	Phenol	W	0.220	0.220
33	Adsorbable Organic Halide - Phase-one	W	1720	1330
	- Phase-two	W	1030	800
	- Phase-three	W	549	426
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congenersa

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Kimberly-Clark Canada Inc., Huntsville

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	689	343
6	Total Phosphorus	W	19.2	11.7
8	Total Suspended Solids (TSS)	D	916	539
16	Chloroform	W	0.256	0.129
17	Toluene	W	0.0254	0.0254
20	Phenol	W	0.0283	0.0283
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Kimberly-Clark Canada Inc., St. Catharines

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit	Monthly Average Plant Loading Limit
			kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	823	410
6	Total Phosphorus	W	23.0	14.0
8	Total Suspended Solids (TSS)	D	1090	644
16	Chloroform	W	0.306	0.154
17	Toluene	W	0.0303	0.0303
20	Phenol	W	0.0338	0.0338
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Kimberly-Clark Canada Inc., Terrace Bay

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	13700	6860
6	Total Phosphorus	W	384	233
8	Total Suspended Solids (TSS)	D	18400	10800
16	Chloroform	W	5.10	2.58
17	Toluene	W	0.295	0.295
20	Phenol	W	0.567	0.567
33	Adsorbable Organic Halide - Phase-one	W	4420	3430
	- Phase-two	W	2650	2060
	- Phase-three	W	1410	1100
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: MacMillan-Bloedel Ltd.				
ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	1760	876
6	Total Phosphorus	W	49.1	29.8
8	Total Suspended Solids (TSS)	D	2340	1380
16	Chloroform	W	0.653	0.328
17	Toluene	W	0.0647	0.0647
20	Phenol	W	0.0722	0.0722
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Malette Kraft Pulp and Power Company				
ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	4150	2080
6	Total Phosphorus	W	116	70.6
8	Total Suspended Solids (TSS)	D	5560	3270
16	Chloroform	W	1.54	0.780
17	Toluene	W	0.0892	0.0892
20	Phenol	W	0.171	0.171
33	Adsorbable Organic Halide - Phase-one	W	1340	1040
	- Phase-two	W	801	623
	- Phase-three	W	427	332
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: Noranda Forest Products Inc., Recycled Papers

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit	Monthly Average Plant Loading Limit
			kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	2840	1420
6	Total Phosphorus	W	46.3	28.1
8	Total Suspended Solids (TSS)	D	2200	1300
16	Chloroform	W	0.616	0.310
17	Toluene	W	0.0611	0.0611
20	Phenol	W	0.0682	0.0682
33	Adsorbable Organic Halide - Phase-one	W	914	710
	- Phase-two	W	548	426
	- Phase-three	W	293	227
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: QUNO Inc.

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	10500	5270
6	Total Phosphorus	W	295	179
8	Total Suspended Solids (TSS)	D	14100	8290
16	Chloroform	W	3.92	1.98
17	Toluene	W	0.226	0.226
20	Phenol	W	0.435	0.435
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: **St. Marys Paper Inc.**

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit	Monthly Average Plant Loading Limit
			kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	6290	3150
6	Total Phosphorus	W	176	107
8	Total Suspended Solids (TSS)	D	8430	4950
16	Chloroform	W	2.34	1.18
17	Toluene	W	0.135	0.135
20	Phenol	W	0.260	0.260
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: **Sonoco Limited**

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	1660	826
6	Total Phosphorus	W	46.3	28.1
8	Total Suspended Solids (TSS)	D	2200	1300
16	Chloroform	W	0.616	0.310
17	Toluene	W	0.0611	0.0611
20	Phenol	W	0.0682	0.0682
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: **Spruce Falls Inc.**

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit kg/day	Monthly Average Plant Loading Limit kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	11000	5480
6	Total Phosphorus	W	307	186
8	Total Suspended Solids (TSS)	D	14700	8630
16	Chloroform	W	4.08	2.06
17	Toluene	W	0.236	0.236
20	Phenol	W	0.453	0.453
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

PROCESS EFFLUENT LIMITS AND MONITORING FREQUENCY

PLANT: **Strathcona Paper Company**

ATG	Parameter	Monitoring Frequency	Daily Plant Loading Limit	Monthly Average Plant Loading Limit
			kg/day	kg/day
	Column 1	Column 2	Column 3	Column 4
1A	Biochemical Oxygen Demand (5 day)	D	1270	631
6	Total Phosphorus	W	35.4	21.5
8	Total Suspended Solids (TSS)	D	1680	992
16	Chloroform	W	0.471	0.237
17	Toluene	W	0.0467	0.0467
20	Phenol	W	0.0521	0.0521
24	2,3,7,8-Tetrachlorodibenzo-para-dioxin	Q		
	2,3,7,8-Tetrachlorodibenzofuran	Q		
	TEQ	Q		

Explanatory Notes:

D = Daily monitoring requirement
W = Weekly monitoring requirement
Q = Quarterly monitoring requirement
ATG = Analytical Test Group
kg/day = Kilograms per day
TEQ = Total toxic equivalent of 2,3,7,8 substituted dioxin and furan congeners

Schedule 3

COOLING WATER ASSESSMENT MONITORING

PLANT:	All Plants	
ATG	Parameter	Monitoring Frequency
	Column 1	Column 2
3	Hydrogen ion (pH)	W
5a	Dissolved Organic Carbon (DOC)	W
7	Specific Conductance	W
8	Total Suspended Solids (TSS)	W

Explanatory Notes:

W = Weekly monitoring requirement
ATG = Analytical Test Group

Schedule 4
REFERENCE PRODUCTION RATES

Plant	Reference Production Rate	
	Bleached Pulp	Finished Product
	tonne/day	tonne/day
Abitibi-Price Inc., Fort William Division		428
Abitibi-Price Inc., Iroquois Falls Division		906
Abitibi Price Inc., Provincial Papers Division		489
Beaver Wood Fibre Company Ltd.		347
Boise Cascade Canada Ltd., Fort Frances	611	1151
Boise Cascade Canada Ltd., Kenora		1057
Canadian Pacific Forest Products, Dryden	940	1493
Canadian Pacific Forest Products, Thunder Bay	1449	2842
Domtar Inc., Containerboard Division, Red Rock		976
Domtar Inc., Containerboard Division, Trenton		427
Domtar Inc., Fine Papers Division, Cornwall	469	846
Domtar Inc., Fine Papers Division, St. Catharines		196
E.B. Eddy Forest Products Ltd., Espanola	1216	1216
E.B. Eddy Forest Products Ltd., Ottawa		179
James River-Marathon Ltd.	533	533
Kimberly-Clark Canada Inc., Huntsville		118
Kimberly-Clark Canada Inc., St. Catharines		141
Kimberly-Clark Canada Inc., Terrace Bay	1372	1372
MacMillan-Bloedel Ltd.		301
Malette Kraft Pulp and Power Company	415	415
Noranda Forest Products Inc., Recycled Papers	284	284
QUNO Inc.		1053
St. Marys Paper Inc.		629
Sonoco Limited		284
Spruce Falls Inc.		1096
Strathcona Paper Company		217

THE TWELVE MONTH REPORT

APPENDIX II

OF THE

DEVELOPMENT DOCUMENT

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1.0 INTRODUCTION

The Effluent Monitoring Regulation for the MISA Pulp and Paper Sector was promulgated on July 21, 1989. Under the Effluent Monitoring Regulation, each direct discharge pulp and paper mill in Ontario was required to monitor its effluent for a one year period starting on January 1, 1990. The Effluent Monitoring Regulation was designed to produce a comprehensive database on pulp and paper mill effluent quality for use in the setting of effluent limits.

The Effluent Monitoring Regulation required direct dischargers to monitor their process effluent, cooling water effluent, storm water effluent, backwash effluent, emergency overflow effluent and waste disposal site effluent for up to 135 parameters on a daily, thrice weekly, weekly, monthly, bi-monthly and semi-annual basis.

The Development Document for the Effluent Monitoring Regulation for the Pulp and Paper Sector explains why each parameter was monitored and explains the rationale behind the frequency of monitoring.

The pulp and paper sector effluent monitoring results have been previously published in two 'preliminary' reports. The first report, the "Preliminary Report on the First Six Months of Process Effluent Monitoring in the MISA Pulp and Paper Sector (January 1, 1990 to June 30, 1990)", was published in February, 1991. The second report, the "Preliminary Report on the Second Six Months of Process Effluent Monitoring in the MISA Pulp and Paper Sector (July 1, 1990 to December 31, 1990)", was published in September, 1991. Both reports presented 'preliminary' data that had not been subject to quality assurance/quality control (QA/QC) data assessment.

This report presents the effluent monitoring data for the MISA pulp and paper sector following candidate parameter selection and QA/QC data assessment.

2.0 QUANTITY OF ANALYTICAL DATA

The MISA pulp and paper sector effluent monitoring database contains 191,932 data points. As indicated in the table below, over 65% of these data points are for process effluent streams.

It should be noted that the data provided in this report reflect the Ministry database as of May 31, 1991.

Data and Sampling Points

Effluent or Sample Type	Number of Sampling Points	Number of Data Points
Process	29	125,408
Cooling Water	14	4,565
Backwash	3	196
Storm Water	46	2,897
Waste Disposal Site	1	578
Emergency Overflow	9	1,474
Intake (not required by the regulation)	9	10,168
Quality Assurance/Quality Control Data	N/A	46,646
Total	111	191,932

Legend
N/A = not applicable

3.0 MONITORING DATA ANALYSIS

Data Validation

In order to confirm the integrity of the effluent monitoring data, a rigourous data validation exercise was conducted. Data validation involved the analysis of parameter units, sample type codes and remark codes to ensure that the correct units and codes had been used. The database was also analyzed for completeness to ensure that all of the required data had been submitted to the ministry.

Data validation also involved the analysis of multiple records. Multiple records occur when two or more records exist for the same parameter for the same control point for the same day. Multiple records were removed to remove the erroneous values. An analysis was also made of outlier values in order to ensure that all data points were correctly reported and that the outlier values were not the result of data entry error.

Following the completion of the data validation exercise, the database was analyzed in order to select candidate parameters for effluent limit setting.

Candidate Parameter Selection

The selection criteria identified in the draft Issue Resolution Committee report were used to select candidate parameters for effluent limit setting. Candidate parameters were selected unless the effluent monitoring data showed (at a 95% confidence level) that a statistical portion of 0.9 of the data were at a concentration of less than the RMDL. The selection approach used is a very conservative approach in selecting parameters for effluent limit setting.

QA/QC Data Assessment

An assessment of the quality assurance/quality control data was made in order to determine whether the effluent monitoring data are of reliable quality and are satisfactory for use in the development of effluent limits. The QA/QC data assessment involved the retrieval and screening of all the field QA/QC data for a particular mill and all the corresponding effluent monitoring data for each process effluent stream at the mill. The data were then sorted and summarized and an evaluation of the data was made based on the procedures outlined in the draft Issue Resolution Committee reports.

The QA/QC data asssessment confirmed that the majority of the data are of reliable quality and are satisfactory for use in the development of effluent limits.

Monitoring Data Analysis

In order to analyze the effluent monitoring data and prepare this report, the following rules were applied to the data:

- All analytical results with remark codes "<DL", "<T", "<W", "<WE", "<", ">", "A" or analytical results without a remark code were used.
- All analytical results with remark codes different than the ones mentioned above were not used because the results are questionable (approximately 4.5% of the data).

- All analytical results were assigned the value reported unless the value was less than the RMDL/10, in which case the RMDL/10 value was substituted.

- Daily loading values (kg/day) for process and cooling water effluents were calculated as the product of daily flow and daily concentration.

- For pulp and paper mills that have two process effluent streams (ie. Abitibi-Price Inc., Fort William Division and MacMillan-Bloedel Ltd.), average daily loadings are reported by calculating the sum of the long-term average daily loadings for each effluent stream.

4.0 MONITORING DATA RESULTS

Tables 1.1 to 1.5 list the average daily loadings of the parameters monitored daily, thrice-weekly and weekly for mill and each category. Some of the mills only monitored the parameters Ammonia plus Ammonium, Nitrate and Nitrite, Total Kjeldahl Nitrogen and Total Phosphorus on a monthly basis. However, for the purpose of comparison, data for these mills have been included in the tables.

Under the effluent monitoring regulation, mills were permitted to monitor for either chemical oxygen demand (COD) or dissolved organic carbon (DOC) on a daily basis. As a result, either COD or DOC loading are listed for each mill. Also under the effluent monitoring regulation, mills that bleach some of their product using chlorine and chlorine compounds were required to monitor adsorbable organic halide (AOX) which measures organochlorine compounds.

The effluent monitoring regulation required mills with biological effluent treatment systems to monitor for volatile suspended solids and sulphate (kraft) mills were required to monitor for dichlorodehydroabietic acid.

Tables 2.1 to 2.27 list for each mill and for each process effluent, the total number of analyses, frequency of detection above the RMDL and long-term average concentrations of the candidate parameters monitored. The tables also present the results of the QA/QC data assessment for each parameter. Data are identified in terms of whether they are of reliable quality, limited quality or unreliable quality.

The Kimberly-Clark mill in Huntsville spray irrigates effluent during the summer and only discharges effluent during the colder months of the year. Therefore, only six months of effluent monitoring data (including flow measurement data) are reported for this mill.

Table 3.1 lists the annual average process effluent flowrates for each mill in the sector and for the sector as a whole.

Tables 4.1 to 4.14 list the number of analyses, frequency of detection above the RMDL, long-term average concentrations and loadings of parameters monitored in cooling water effluent.

Tables 5.1 to 5.9 list the number of analyses, frequency of detection above the RMDL and long-term average concentrations of parameters monitored in emergency overflow effluent and the volume discharged.

Tables 6.1 to 6.3 list the number of analyses, frequency of detection above the RMDL and long-term average concentrations of parameters monitored in backwash effluent and the volume discharged.

Table 7.1 lists the number of analyses, frequency of detection above the RMDL and long-term average concentrations of parameters monitored in waste disposal site effluent and the flow.

Tables 8.1 to 8.46 list the number of analyses, frequency of detection above the RMDL and long-term average concentrations of parameters monitored in storm water effluent and the volume discharged.

Tables 9.1 to 9.9 list the number of analyses, frequency of detection above the RMDL and long-term average concentrations of parameters monitored in intake water and where available, intake water flow.

5.0 DISCUSSION OF RESULTS

To come.

6.0 CONCLUSIONS

To come.

TABLE 1.1
AVERAGE DAILY LOADINGS (kg/day) OF PARAMETERS MONITORED DAILY, THRICE-WEEKLY AND WEEKLY IN MISA PULP AND PAPER SECTOR PROCESS EFFLUENTS

PARAMETER	Sulphate (Kraft) Category (9 mills) Total	Sulphite-Mechanical Category (8 mills) Total	Corrugating Category (2 mills) Total	Deinking/ Board/Fine Papers/Tissue Category (8 mills) Total	Sector Total
Adsorbable Organic Halide (AOX)	15,493	.	.	115	15,608
Aluminum	1,867	503	25	172	2,567
Ammonia plus Ammonium	678	133	132	11.8	954.8
BOD, 5 day, Total Demand	120,268	172,864	37,142	9,773	340,047
COD	508,068	191,185	12,009	17,504	728,766
DOC	11,725	91,612	32,394	2,755	138,533
Dehydroabietic Acid	553	951	7	36	1,547
Dichlorodehydroabietic Acid	43	.	.	.	43
Nitrate+Nitrite	1,110	68	6,796	19.5	7,993.5
Total Kjeldahl Nitrogen	2,894	1,034	533	184	4,645
Total phosphorus	604	182	58	9.2	853.2
Total suspended solids	57,971	31,960	3,247	3,894	97,072
Volatile suspended solids	20,195	2,309	1,857	956	25,317
Zinc	89	41	10	10.11	150.11

. = not monitored for this category

TABLE 1.2
AVERAGE DAILY LOADINGS (kg/day) OF PARAMETERS MONITORED DAILY, THRICE-WEEKLY AND WEEKLY IN SULPHATE (KRAFT) PROCESS EFFLUENT

PARAMETER	Mill									Total
	Boise (F)	CP (Dry.)	CP (T.Bay)	Domtar (C)	Domtar (RR)	Eddy (E)	James R.	KC (Terr.)	Malette	
Adsorbable Organic Halide	1,964	1,936	4,171	431	175	854	2,787	1,967	1,208	15,493
Aluminum	92	111	844	208	291	75	16	47	183	1,867
Ammonia plus Ammonium	8	78	106	61	41	109	153	85	37	678
BOD, 5 day, Total Demand	9,430	2,761	48,622	20,867	15,326	1,808	11,991	1,452	8,011	120,268
COD	60,456	47,624	172,179	60,335	41,041	.	46,622	48,291	31,520	508,068
DOC	.	.	.	.	.	11,725	.	.	.	11,725
Dehydroabietic Acid	32	6	312	59	110	2	3	1	28	553
Dichlorodehydroabietic Acid	12	6	11	2	2	*	3	1	6	43
Nitrate+Nitrite	12	770	*	32	13	15	211	37	20	1,110
Total Kjeldahl Nitrogen	752	177	263	430	179	378	181	432	102	2,894
Total phosphorus	147	117	116	44	23	56	36	45	20	604
Total suspended solids	10,987	5,011	15,335	9,750	6,026	2,592	2,654	3,866	1,750	57,971
Volatile suspended solids	10,201	4,671	.	.	.	1,739	.	3,584	.	20,195
Zinc	13	10	28	6	4	9	4	8	7	89

. = not monitored at this mill
* = not found more than 5% of the time at this mill.

TABLE 1.3
AVERAGE DAILY LOADINGS (kg/day) OF PARAMETERS MONITORED DAILY, THRICE-WEEKLY AND WEEKLY IN SULPHITE-MECHANICAL PROCESS EFFLUENT

PARAMETER	Mill								Total
	AP (Ft.W)	AP (I.Falls)	AP (PP)	AP (T.Bay)	Boise (K)	Q&O	St. Marys	Spruce F.	
Aluminum	14	188	86	55	17	43	78	22	503
Ammonia plus Ammonium	4	*	11	*	*	114	4	*	133
BOD, 5 day, Total Demand	13,277	50,054	4,265	28,280	33,132	1,385	6,849	35,622	172,864
COD	.	.	.	.	99,342	.	21,152	70,691	191,185
DOC	10,409	47,969	2,916	28,519	.	1,799	.	.	91,659
Dehydroabietic Acid	111	265	22	79	220	5	74	175	951
Nitrate+Nitrite	*	15	13	9	11	20	*	*	68
Total Kjeldahl Nitrogen	89	226	52	85	101	227	42	212	1,034
Total phosphorus	16	53	4	11	16	27	31	24	182
Total suspended solids	1,227	7,766	1,599	1,869	3,376	3,049	5,814	7,260	31,960
Volatile suspended solids	.	.	.	.	.	2,309	.	.	2,309
Zinc	2	9	2	3	3	10	2	10	41

. = not monitored at this mill
* = not found more than 5% of the time at this mill.

TABLE 1.4
AVERAGE DAILY LOADINGS (kg/day) OF PARAMETERS MONITORED DAILY, THRICE-WEEKLY AND WEEKLY IN CORRUGATING PROCESS EFFLUENT

PARAMETER	Mill		Total
	Domtar (Tr.)	MacMillan	
Aluminum	12	13	25
Ammonia plus Ammonium	1	131	132
BOD, 5 day, Total Demand	5,130	32,012	37,142
COD	12,009	.	12,009
DOC	.	32,394	32,394
Dehydroabietic Acid	5	2	7
Nitrate+Nitrite	3	6,793	6,796
Total Kjeldahl Nitrogen	32	501	533
Total phosphorus	5	53	58
Total suspended solids	623	2,624	3,247
Volatile suspended solids	.	1,857	1,857
Zinc	1	9	10

. = not monitored at this mill

TABLE 1.5
AVERAGE DAILY LOADINGS (kg/day) OF PARAMETERS MONITORED DAILY, THRICE-WEEKLY AND WEEKLY IN DEINKING/BOARD/FINE PAPERS/TISSUE PROCESS EFFLUENT

	Mill								
PARAMETER	Beaver	Domtar (St.C)	Eddy (O)	KC (H)	KC (St.C)	Noranda	Strathcona	Trent V.	Total
Adsorbable Organic Halide	.	.	.	.	.	115	.	.	115
Aluminum	12	15	22	0.03	1	97	3	22	172
Ammonia plus Ammonium	*	*	1.6	*	*	2.7	7.1	0.4	11.8
BOD, 5 day, Total Demand	1,920	1,025	1,148	3	319	3,463	386	1,509	9,773
COD	.	8,680	2,735	62	1,064	.	1,502	3,461	17,504
DOC	1,040	.	.	.	.	1,714	.	.	2,755
Dehydroabietic Acid	12	10	3	0.01	1	7	1	2	36
Nitrate+Nitrite	2	3	2	0.1	1	11	*	0.4	19.5
Total Kjeldahl Nitrogen	35	19	27	5	19	29	37	13	184
Total phosphorus	2	*	1	0.2	1	2	2	1	9.2
Total suspended solids	688	379	450	4	66	1,569	214	524	3,894
Volatile suspended solids	.	.	.	.	.	748	208	.	956
Zinc	0.46	0.16	0.15	0.01	6.59	2.13	0.07	0.54	10.11

. = not monitored at this mill.
* = not found more than 5% of the time at this mill.

(Notes)

TABLE 2.1a
ABITIBI-PRICE INC., FORT WILLIAM DIVISION
PROCESS EFFLUENT
(Control Point 0100)

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	331	100	6.65		
4a	Total Kjeldahl Nitrogen	11	100	2.76	mg/L	1
5a	DOC	332	100	357.61	mg/L	1
6	Total phosphorus	11	91	.38	mg/L	1
7	Specific conductance	331	100	908.49	µS/cm	1
8	Total suspended solids	332	100	31.11	mg/L	1
9	Aluminum	48	100	428.33	µg/L	1
	Copper	9	67	40.33	µg/L	1
	Zinc	48	98	46.23	µg/L	1
16	1,2-Dichloroethane	11	45	.65	µg/L	X
	Chloroform	11	100	25.45	µg/L	2
	Methylene chloride	11	64	6.21	µg/L	X
17	Toluene	11	91	7.08	µg/L	1
20	Phenol	10	100	19.59	µg/L	2
	m-Cresol	10	70	4.88	µg/L	1
	p-Cresol	10	90	7.24	µg/L	1
24	Octachlorodibenzo-p-dioxin	6	83	.10	ng/L	1
26	Abietic Acid	11	100	2.77	mg/L	1
	Dehydroabietic Acid	144	99	3.67	mg/L	1
	Isopimaric Acid	11	100	2.56	mg/L	1
	Levopimaric Acid	11	91	.22	mg/L	1
	Neoabietic Acid	11	100	.27	mg/L	1
	Oleic Acid	11	82	.09	mg/L	1
	Pimaric Acid	11	100	.48	mg/L	1
M8	BOD, 5 day, Total Demand	143	100	442.22	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.1b
ABITIBI-PRICE INC., FORT WILLIAM DIVISION
PROCESS EFFLUENT
(Control Point 0200)

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	331	100	6.99		
4a	Ammonia plus Ammonium	11	36	.27	mg/L	1
	Total Kjeldahl Nitrogen	11	100	5.74	mg/L	1
5a	DOC	332	100	546.60	mg/L	1
6	Total phosphorus	10	100	1.72	mg/L	1
7	Specific conductance	331	100	1,251.92	µS/cm	1
8	Total suspended solids	332	100	124.81	mg/L	1
9	Aluminum	50	100	1,314.66	µg/L	1
	Copper	8	75	51.50	µg/L	1
	Zinc	50	100	165.74	µg/L	1
16	1,2-Dichloroethane	11	45	.65	µg/L	X
	Chloroform	11	100	5.71	µg/L	2
	Methylene chloride	11	64	12.60	µg/L	X
17	Toluene	11	91	26.30	µg/L	1
	o-Xylene	11	36	.45	µg/L	1
19	Camphene	11	73	6.36	µg/L	1
20	Phenol	11	100	62.64	µg/L	2
	m-Cresol	11	91	17.29	µg/L	1
	p-Cresol	11	100	85.53	µg/L	1
24	Octachlorodibenzo-p-dioxin	6	83	.09	ng/L	1
26	Abietic Acid	11	100	4.05	mg/L	1
	Dehydroabietic Acid	145	100	6.55	mg/L	1
	Isopimaric Acid	10	100	3.27	mg/L	1
	Levopimaric Acid	11	91	1.69	mg/L	1
	Neoabietic Acid	11	91	1.25	mg/L	1
	Oleic Acid	11	73	.37	mg/L	1
	Pimaric Acid	11	100	1.01	mg/L	1
M8	BOD, 5 day, Total Demand	144	100	774.14	mg/L	1

<u>Legend</u>
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.2
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	334	100	5.17		
4a	Total Kjeldahl Nitrogen	11	100	3.45	mg/L	1
4b	Nitrate+Nitrite	11	36	.23	mg/L	1
5a	DOC	334	100	738.61	mg/L	1
6	Total phosphorus	11	100	.81	mg/L	1
7	Specific conductance	334	100	1,072.35	µS/cm	1
8	Total suspended solids	334	100	119.36	mg/L	1
9	Aluminum	48	100	2,927.81	µg/L	1
	Copper	11	100	30.91	µg/L	1
	Zinc	47	98	133.85	µg/L	1
16	1,2-Dichloroethane	11	45	.65	µg/L	X
	Chloroform	11	91	17.81	µg/L	1
	Methylene chloride	11	64	3.58	µg/L	X
17	Benzene	11	45	1.80	µg/L	3
	Toluene	11	55	.56	µg/L	3
19	Camphene	11	55	5.32	µg/L	1
20	Phenol	11	82	2.83	µg/L	1
	m-Cresol	11	55	2.75	µg/L	1
24	Octachlorodibenzofuran	2	100	.09	ng/L	1
26	Abietic Acid	11	100	2.40	mg/L	1
	Dehydroabietic Acid	140	100	4.08	mg/L	1
	Isopimaric Acid	11	91	1.80	mg/L	1
	Levopimaric Acid	11	73	.21	mg/L	1
	Neoabietic Acid	11	100	.32	mg/L	1
	Oleic Acid	11	73	.08	mg/L	1
	Pimaric Acid	11	91	.32	mg/L	1
M8	BOD, 5 day, Total Demand	142	100	774.01	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.3
ABITIBI-PRICE INC., PROVINCIAL PAPERS DIVISION
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	311	100	7.07		
4a	Ammonia plus Ammonium	11	36	.23	mg/L	1
	Total Kjeldahl Nitrogen	11	100	1.11	mg/L	1
4b	Nitrate+Nitrite	11	64	.27	mg/L	1
5a	DOC	314	100	61.56	mg/L	1
7	Specific conductance	314	100	342.08	µS/cm	1
8	Total suspended solids	311	100	33.46	mg/L	1
9	Aluminum	48	100	1,816.67	µg/L	1
	Zinc	48	94	33.96	µg/L	X
16	1,2-Dichloroethane	11	45	.65	µg/L	1
	Chloroform	11	100	3.93	µg/L	X
	Methylene chloride	11	64	7.53	µg/L	2
17	Benzene	11	45	1.26	µg/L	1
	Styrene	11	73	1.26	µg/L	1
	Toluene	11	45	.52	µg/L	1
	o-Xylene	11	36	2.20	µg/L	1
26	Abietic Acid	11	55	.02	mg/L	1
	Dehydroabietic Acid	136	98	.46	mg/L	1
	Isopimaric Acid	11	91	.04	mg/L	1
	Pimaric Acid	11	55	.02	mg/L	1
M8	BOD, 5 day, Total Demand	134	100	89.81	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.4
ABITIBI-PRICE INC., THUNDER BAY DIVISION
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	331	100	4.88		
4a	Total Kjeldahl Nitrogen	12	100	1.85	mg/L	1
4b	Nitrate+Nitrite	12	42	.21	mg/L	1
5a	DOC	326	100	607.42	mg/L	1
6	Total phosphorus	12	100	.24	mg/L	1
7	Specific conductance	331	100	694.91	µS/cm	1
8	Total suspended solids	331	100	39.85	mg/L	1
9	Aluminum	49	100	1,168.08	µg/L	1
	Zinc	49	100	73.83	µg/L	X
16	1,2-Dichloroethane	11	45	.65	µg/L	1
	Chloroform	11	73	2.70	µg/L	X
	Methylene chloride	11	45	3.30	µg/L	3
17	Benzene	11	36	1.89	µg/L	1
	Toluene	11	64	.74	µg/L	1
20	Phenol	11	55	3.62	µg/L	1
	m-Cresol	11	64	5.22	µg/L	1
	p-Cresol	11	36	9.17	µg/L	3
24	Octachlorodibenzo-p-dioxin	9	44	1.58	ng/L	1
26	Abietic Acid	11	100	1.51	mg/L	1
	Dehydroabietic Acid	142	100	1.68	mg/L	1
	Isopimaric Acid	11	91	.60	mg/L	1
	Levopimaric Acid	11	91	.16	mg/L	1
	Neoabietic Acid	11	91	.22	mg/L	1
	Oleic Acid	11	82	.10	mg/L	1
	Pimaric Acid	11	91	.14	mg/L	1
M8	BOD, 5 day, Total Demand	144	100	603.31	mg/L	

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.5
BEAVER WOOD FIBRE COMPANY
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	260	100	7.27		
4a	Total Kjeldahl Nitrogen	12	100	2.18	mg/L	1
5a	DOC	259	100	68.43	mg/L	1
6	Total phosphorus	12	58	.12	mg/L	1
7	Specific conductance	259	100	379.67	µS/cm	1
8	Total suspended solids	258	100	45.29	mg/L	1
9	Aluminum	45	100	774.11	µg/L	1
	Copper	12	33	9.67	µg/L	3
	Zinc	44	95	29.30	µg/L	3
16	1,1-Dichloroethylene	12	58	5.73	µg/L	3
	Methylene chloride	12	33	2.01	µg/L	X
17	Benzene	12	33	.77	µg/L	3
	Toluene	12	92	4.98	µg/L	1
	m-Xylene and p-Xylene	12	42	.95	µg/L	3
	o-Xylene	12	33	.43	µg/L	1
20	Phenol	12	83	8.33	µg/L	1
24	Octachlorodibenzo-p-dioxin	2	100	.07	ng/L	1
26	Abietic Acid	12	67	.11	mg/L	3
	Dehydroabietic Acid	12	100	.72	mg/L	1
	Isopimaric Acid	12	100	.14	mg/L	1
	Levopimaric Acid	12	42	.06	mg/L	3
	Neoabietic Acid	12	33	.02	mg/L	2
	Oleic Acid	11	45	.08	mg/L	3
	Pimaric Acid	12	83	.04	mg/L	1
M8	BOD, 5 day, Total Demand	137	100	123.13	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.6
BOISE CASCADE CANADA LTD., FORT FRANCES
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	362	100	745.93	mg/L	1
3	Hydrogen ion (pH)	364	100	6.83		
4a	Total Kjeldahl Nitrogen	52	100	9.31	mg/L	1
6	Total phosphorus	52	100	1.82	mg/L	1
7	Specific conductance	363	100	1,615.47	µS/cm	1
8	Total suspended solids	364	100	135.82	mg/L	1
	Volatile suspended solids	52	100	126.65	mg/L	1
9	Aluminum	52	100	1,134.62	µg/L	1
	Copper	12	100	22.08	µg/L	1
	Thallium	12	58	26.25	µg/L	X
	Zinc	52	100	167.19	µg/L	1
15	Sulphide	12	100	.24	mg/L	1
16	Bromodichloromethane	12	92	.94	µg/L	X
	Chloroform	12	100	743.58	µg/L	1
	Methylene chloride	12	33	24.61	µg/L	X
17	Toluene	12	92	13.30	µg/L	1
19	Benzo(g,h,i)perylene	11	100	1.70	µg/L	X
	Benzo(k)fluoranthene	12	92	.78	µg/L	X
	Camphene	12	83	15.09	µg/L	1
	Dibenz(a,h)anthracene	11	100	1.40	µg/L	X
20	2,3,5-Trichlorophenol	12	67	4.42	µg/L	X
	2,4,6-Trichlorophenol	12	42	6.92	µg/L	1
	2,4-Dichlorophenol	12	67	3.62	µg/L	1
	o-Cresol	12	67	8.63	µg/L	1
23	1,2,3,5-Tetrachlorobenzene	5	60	1.02	µg/L	X
	1,2,3-Trichlorobenzene	10	70	.78	µg/L	X
	1,2,4,5-Tetrachlorobenzene	5	80	.09	µg/L	X
	2,4,5-Trichlorotoluene	10	100	.83	µg/L	X
	Hexachlorobenzene	11	64	.11	µg/L	X
	Hexachlorocyclopentadiene	9	56	.06	µg/L	X
	Octachlorostyrene	10	50	.03	µg/L	X
	Pentachlorobenzene	11	45	.14	µg/L	X
24	Total TCDF	11	73	.16	ng/L	1
	Octachlorodibenzo-p-dioxin	11	36	.03	ng/L	1
26	Abietic Acid	12	58	.06	mg/L	1
	Chlorodehydroabietic Acid	11	82	.10	mg/L	2
	Dehydroabietic Acid	149	94	.40	mg/L	1
	Dichlorodehydroabietic Acid	148	93	.14	mg/L	1
	Isopimaric Acid	11	100	.18	mg/L	1
	Levopimaric Acid	11	73	.02	mg/L	1
	Neoabietic Acid	12	67	.02	mg/L	1
	Oleic Acid	11	82	.19	mg/L	1
	Pimaric Acid	11	91	.08	mg/L	1
M8	BOD, 5 day, Total Demand	157	100	118.98	mg/L	1
M13	Adsorbable Organic Halide	158	100	24.56	mg/L	1

<u>Legend</u>
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.7
BOISE CASCADE CANADA LTD., KENORA
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	356	100	1,952.83	mg/L	1
3	Hydrogen ion (pH)	361	100	4.61		
4a	Total Kjeldahl Nitrogen	12	100	2.04	mg/L	1
4b	Nitrate+Nitrite	12	42	.23	mg/L	1
6	Total phosphorus	12	100	.31	mg/L	1
7	Specific conductance	361	100	970.63	µS/cm	1
8	Total suspended solids	362	100	66.21	mg/L	1
9	Aluminum	52	100	333.40	µg/L	1
	Copper	12	100	16.25	µg/L	1
	Zinc	52	100	57.16	µg/L	1
16	Bromodichloromethane	12	92	1.41	µg/L	X
	Chloroform	12	75	7.44	µg/L	1
19	Benzo(g,h,i)perylene	12	92	1.61	µg/L	X
	Benzo(k)fluoranthene	12	92	.78	µg/L	X
	Dibenz(a,h)anthracene	12	92	1.33	µg/L	X
23	1,2,3-Trichlorobenzene	11	91	.09	µg/L	X
	1,2,4-Trichlorobenzene	10	60	.07	µg/L	X
	2,4,5-Trichlorotoluene	7	71	.37	µg/L	X
	Pentachlorobenzene	11	36	.02	µg/L	X
24	Octachlorodibenzo-p-dioxin	6	83	.17	ng/L	1
26	Abietic Acid	11	100	4.21	mg/L	1
	Chlorodehydroabietic Acid	12	92	.14	mg/L	2
	Dehydroabietic Acid	145	99	4.29	mg/L	1
	Isopimaric Acid	11	100	5.02	mg/L	1
	Levopimaric Acid	9	44	.33	mg/L	1
	Neoabietic Acid	11	82	.94	mg/L	1
	Oleic Acid	11	100	1.02	mg/L	1
	Pimaric Acid	11	100	.74	mg/L	1
M8	BOD, 5 day, Total Demand	154	100	651.19	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.8
CANADIAN PACIFIC FOREST PRODUCTS LTD., DRYDEN
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	360	100	533.28	mg/L	1
3	Hydrogen ion (pH)	360	100	7.21		
4a	Ammonia plus Ammonium	53	83	.86	mg/L	1
	Total Kjeldahl Nitrogen	53	94	1.99	mg/L	1
4b	Nitrate+Nitrite	53	100	8.86	mg/L	1
6	Total phosphorus	12	100	1.25	mg/L	1
7	Specific conductance	360	100	1,728.04	µS/cm	1
8	Total suspended solids	360	100	55.98	mg/L	1
	Volatile suspended solids	52	96	52.62	mg/L	1
9	Aluminum	65	92	1,245.39	µg/L	1
	Molybdenum	12	75	20.46	µg/L	X
	Thallium	12	58	27.92	µg/L	X
	Zinc	65	92	109.23	µg/L	1
15	Sulphide	12	92	.08	mg/L	1
16	Bromodichloromethane	11	100	1.46	µg/L	X
	Chloroform	11	100	124.55	µg/L	2
19	Benzo(g,h,i)perylene	12	92	1.61	µg/L	X
	Benzo(k)fluoranthene	12	92	.78	µg/L	X
	Dibenz(a,h)anthracene	12	92	1.33	µg/L	X
20	2,3,5-Trichlorophenol	12	83	10.28	µg/L	X
	2,4-Dichlorophenol	12	75	3.83	µg/L	1
23	1,2,3,4-Tetrachlorobenzene	8	38	.02	µg/L	X
	1,2,3,5-Tetrachlorobenzene	8	38	.31	µg/L	X
	1,2,3-Trichlorobenzene	9	100	.74	µg/L	X
	1,2,4,5-Tetrachlorobenzene	9	44	.06	µg/L	X
	2,4,5-Trichlorotoluene	8	63	.41	µg/L	X
	Hexachlorobenzene	9	44	.48	µg/L	X
	Hexachlorobutadiene	8	75	.04	µg/L	X
	Octachlorostyrene	7	71	.23	µg/L	X
	Pentachlorobenzene	9	56	.15	µg/L	X
24	Total TCDF	12	67	.06	ng/L	1
26	Abietic Acid	12	50	.02	mg/L	1
	Chlorodehydroabietic Acid	12	83	.05	mg/L	1
	Dehydroabietic Acid	159	97	.07	mg/L	1
	Dichlorodehydroabietic Acid	158	97	.06	mg/L	1
	Isopimaric Acid	12	58	.01	mg/L	3
	Levopimaric Acid	12	33	.01	mg/L	1
	Neoabietic Acid	12	50	.01	mg/L	2
	Oleic Acid	12	83	.06	mg/L	1
	Pimaric Acid	12	42	.01	mg/L	3
M8	BOD, 5 day, Total Demand	158	100	31.07	mg/L	1
M13	Adsorbable Organic Halide	158	100	21.62	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.9
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	279	100	975.21	mg/L	1
3	Hydrogen ion (pH)	280	100	6.59		
4a	Total Kjeldahl Nitrogen	40	95	1.49	mg/L	1
6	Total phosphorus	40	100	.66	mg/L	1
7	Specific conductance	281	100	1,565.31	µS/cm	1
8	Total suspended solids	281	100	86.86	mg/L	1
9	Aluminum	43	100	4,781.40	µg/L	1
	Chromium	10	100	67.98	µg/L	1
	Copper	10	100	22.60	µg/L	1
	Zinc	43	100	161.52	µg/L	1
15	Sulphide	10	90	.13	mg/L	1
16	Bromodichloromethane	10	90	.95	µg/L	X
	Chloroform	10	100	1,520.94	µg/L	1
19	Benzo(g,h,i)perylene	10	100	1.70	µg/L	X
	Benzo(k)fluoranthene	10	100	.80	µg/L	X
	Dibenz(a,h)anthracene	10	100	1.40	µg/L	X
20	2,3,5-Trichlorophenol	10	40	3.13	µg/L	X
	2,4,6-Trichlorophenol	10	50	5.27	µg/L	1
	2,4-Dichlorophenol	10	90	3.91	µg/L	1
	Phenol	10	90	27.85	µg/L	2
23	1,2,3-Trichlorobenzene	9	78	.69	µg/L	X
	1,2,4,5-Tetrachlorobenzene	6	50	.20	µg/L	X
	2,4,5-Trichlorotoluene	10	70	1.44	µg/L	X
	Hexachlorobenzene	8	88	.49	µg/L	X
	Hexachlorobutadiene	6	50	.05	µg/L	X
	Hexachloroethane	9	56	.04	µg/L	X
	Octachlorostyrene	9	67	.06	µg/L	X
24	Total TCDF	11	64	.05	ng/L	1
	Octachlorodibenzo-p-dioxin	11	36	.13	ng/L	1
26	Abietic Acid	10	70	.66	mg/L	1
	Chlorodehydroabietic Acid	10	80	.31	mg/L	1
	Dehydroabietic Acid	120	100	1.79	mg/L	1
	Dichlorodehydroabietic Acid	119	99	.06	mg/L	1
	Isopimaric Acid	10	70	.81	mg/L	1
	Levopimaric Acid	9	44	.05	mg/L	1
	Neoabietic Acid	10	60	.17	mg/L	1
	Oleic Acid	10	80	.27	mg/L	1
	Pimaric Acid	10	70	.15	mg/L	1
M8	BOD, 5 day, Total Demand	121	100	276.84	mg/L	1
M13	Adsorbable Organic Halide	131	100	23.91	mg/L	1

<u>Legend</u>
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.10
DOMTAR INC., CONTAINERBOARD DIVISION (RED ROCK)
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	358	100	423.27	mg/L	1
3	Hydrogen ion (pH)	361	100	8.37		
4a	Ammonia plus Ammonium	11	82	.41	mg/L	1
	Total Kjeldahl Nitrogen	11	100	1.78	mg/L	1
6	Total phosphorus	11	100	.23	mg/L	1
7	Specific conductance	361	100	677.03	µS/cm	1
8	Total suspended solids	361	100	62.13	mg/L	1
9	Aluminum	48	100	2,977.92	µg/L	1
	Zinc	48	100	38.54	µg/L	1
15	Sulphide	11	100	.41	mg/L	1
16	Chloroform	11	100	133.63	µg/L	1
20	2,4,6-Trichlorophenol	9	56	2.83	µg/L	1
	Phenol	11	82	9.64	µg/L	1
24	Octachlorodibenzo-p-dioxin	12	92	.33	ng/L	1
26	Abietic Acid	11	100	.86	mg/L	1
	Dehydroabietic Acid	144	100	1.14	mg/L	1
	Dichlorodehydroabietic Acid	143	20	.02	mg/L	1
	Isopimaric Acid	11	100	.23	mg/L	2
	Neoabietic Acid	11	100	1.29	mg/L	1
	Oleic Acid	11	91	.07	mg/L	1
	Pimaric Acid	11	91	.09	mg/L	1
M8	BOD, 5 day, Total Demand	157	100	157.88	mg/L	1
M13	Adsorbable Organic Halide	144	99	1.78	mg/L	1

<u>Legend</u>

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.11
DOMTAR INC., CONTAINERBOARD DIVISION (TRENTON)
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	355	100	2,978.18	mg/L	1
3	Hydrogen ion (pH)	355	100	7.92		
4a	Ammonia plus Ammonium	12	50	.36	mg/L	1
	Total Kjeldahl Nitrogen	12	100	7.89	mg/L	1
4b	Nitrate+Nitrite	12	100	.63	mg/L	1
6	Total phosphorus	12	100	1.14	mg/L	1
7	Specific conductance	355	100	1,096.45	µS/cm	1
8	Total suspended solids	355	100	157.04	mg/L	1
9	Aluminum	53	100	3,073.77	µg/L	1
	Cadmium	12	67	3.50	µg/L	1
	Chromium	12	33	21.67	µg/L	1
	Copper	12	100	41.67	µg/L	1
	Zinc	53	100	169.81	µg/L	1
16	Chloroform	7	86	3.23	µg/L	1
20	Phenol	12	100	643.11	µg/L	1
	o-Cresol	12	92	9.98	µg/L	1
24	Total TCDF	2	100	.09	ng/L	1
	Total H6CDD	2	100	.30	ng/L	1
	Total H7CDD	2	100	1.10	ng/L	1
	Total H7CDF	2	100	.32	ng/L	1
	Octachlorodibenzo-p-dioxin	2	100	10.90	ng/L	1
	Octachlorodibenzofuran	2	100	.80	ng/L	1
26	Abietic Acid	12	100	.61	mg/L	1
	Chlorodehydroabietic Acid	12	67	.02	mg/L	2
	Dehydroabietic Acid	157	100	1.17	mg/L	1
	Isopimaric Acid	12	100	.25	mg/L	1
	Neoabietic Acid	12	67	.82	mg/L	1
	Oleic Acid	12	100	.40	mg/L	1
	Pimaric Acid	12	92	.13	mg/L	1
M8	BOD, 5 day, Total Demand	150	100	1,278.72	mg/L	1

<u>Legend</u>
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.12
DOMTAR INC., FINE PAPERS DIVISION (CORNWALL)
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	355	100	467.39	mg/L	1
3	Hydrogen ion (pH)	354	100	7.23		
4a	Ammonia plus Ammonium	12	42	.49	mg/L	1
	Total Kjeldahl Nitrogen	12	100	3.32	mg/L	1
4b	Nitrate+Nitrite	12	33	.25	mg/L	1
6	Total phosphorus	12	100	.34	mg/L	1
7	Specific conductance	355	100	1,089.90	µS/cm	1
8	Total suspended solids	353	100	75.65	mg/L	1
9	Aluminum	52	100	1,587.50	µg/L	1
	Copper	12	58	12.50	µg/L	1
	Zinc	52	100	44.90	µg/L	1
15	Sulphide	12	100	.34	mg/L	1
16	Bromodichloromethane	2	100	2.75	µg/L	1
	Chloroform	12	100	238.83	µg/L	1
17	Benzene	12	100	10.47	µg/L	1
	Styrene	5	100	4.12	µg/L	1
	Toluene	10	100	6.67	µg/L	1
19	Acenaphthylene	6	100	4.52	µg/L	1
	Chrysene	6	67	1.45	µg/L	1
	Fluoranthene	8	100	4.99	µg/L	1
	Naphthalene	6	100	7.78	µg/L	1
	Phenanthrene	11	100	11.83	µg/L	1
	Pyrene	7	100	3.01	µg/L	1
20	Phenol	12	100	103.53	µg/L	3
	o-Cresol	7	71	4.89	µg/L	1
24	Total TCDF	11	91	.04	ng/L	1
	Octachlorodibenzo-p-dioxin	11	100	.17	ng/L	1
26	Abietic Acid	12	100	.19	mg/L	1
	Chlorodehydroabietic Acid	12	100	.04	mg/L	1
	Dehydroabietic Acid	155	100	.46	mg/L	1
	Dichlorodehydroabietic Acid	155	30	.01	mg/L	1
	Isopimaric Acid	12	67	.01	mg/L	1
	Levopimaric Acid	4	75	.02	mg/L	1
	Neoabietic Acid	12	75	.07	mg/L	1
	Oleic Acid	12	100	.10	mg/L	1
	Pimaric Acid	12	50	.01	mg/L	1
M8	BOD, 5 day, Total Demand	151	100	162.27	mg/L	1
M13	Adsorbable Organic Halide	155	99	3.31	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.13
DOMTAR INC., FINE PAPERS DIVISION (ST. CATHARINES)
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	354	100	834.68	mg/L	1
3	Hydrogen ion (pH)	355	100	6.88		
4a	Total Kjeldahl Nitrogen	11	100	1.83	mg/L	1
4b	Nitrate+Nitrite	12	58	.29	mg/L	1
7	Specific conductance	356	100	391.24	µS/cm	1
8	Total suspended solids	356	99	37.51	mg/L	1
9	Aluminum	51	98	1,456.92	µg/L	1
	Copper	12	33	8.33	µg/L	1
	Zinc	50	72	16.26	µg/L	3
16	Chloroform	12	50	1.80	µg/L	1
	Methylene chloride	12	50	11.24	µg/L	X
17	Benzene	12	33	1.36	µg/L	1
24	Total H6CDF	6	100	.02	ng/L	X
	Octachlorodibenzo-p-dioxin	5	100	.21	ng/L	X
26	Abietic Acid	12	83	.14	mg/L	1
	Chlorodehydroabietic Acid	12	42	.02	mg/L	2
	Dehydroabietic Acid	12	100	.99	mg/L	1
	Isopimaric Acid	12	92	.06	mg/L	1
	Levopimaric Acid	12	67	.07	mg/L	1
	Pimaric Acid	12	50	.05	mg/L	1
M8	BOD, 5 day, Total Demand	158	100	100.81	mg/L	1

<u>Legend</u>
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.14
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	359	100	7.61		
4a	Ammonia plus Ammonium	12	75	1.01	mg/L	1
	Total Kjeldahl Nitrogen	12	100	3.48	mg/L	1
5a	DOC	359	100	114.66	mg/L	1
6	Total phosphorus	12	100	.51	mg/L	1
7	Specific conductance	359	100	1,469.81	µS/cm	1
8	Total suspended solids	359	95	24.96	mg/L	1
	Volatile suspended solids	54	78	16.47	mg/L	1
9	Aluminum	63	100	767.94	µg/L	1
	Copper	7	57	51.86	µg/L	1
	Nickel	11	73	31.36	µg/L	1
	Zinc	60	97	85.10	µg/L	1
15	Sulphide	12	100	1.00	mg/L	1
16	Chloroform	12	100	16.44	µg/L	1
	Methylene chloride	12	50	15.03	µg/L	X
17	Benzene	12	50	2.70	µg/L	1
	Toluene	12	33	.68	µg/L	1
20	2,4,6-Trichlorophenol	12	75	3.78	µg/L	1
24	Total TCDF	10	50	.04	ng/L	1
26	Dehydroabietic Acid	167	38	.02	mg/L	1
M8	BOD, 5 day, Total Demand	164	98	17.30	mg/L	1
M13	Adsorbable Organic Halide	152	100	8.20	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.15
E.B. EDDY FOREST PRODUCTS LTD., OTTAWA
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	329	100	369.22	mg/L	1
3	Hydrogen ion (pH)	329	100	7.37		
4a	Ammonia plus Ammonium	12	50	.21	mg/L	1
	Total Kjeldahl Nitrogen	12	100	3.59	mg/L	1
4b	Nitrate+Nitrite	12	75	.27	mg/L	1
7	Specific conductance	329	100	363.13	µS/cm	1
8	Total suspended solids	329	100	61.07	mg/L	1
9	Aluminum	54	100	2,977.59	µg/L	1
	Copper	11	55	9.18	µg/L	1
	Zinc	54	61	21.91	µg/L	1
16	1,2-Dichloroethane	12	50	1.06	µg/L	X
	Chloroform	12	83	3.66	µg/L	1
19	Naphthalene	11	55	1.97	µg/L	1
23	1,2,3,4-Tetrachlorobenzene	12	33	.01	µg/L	1
	1,2,3-Trichlorobenzene	12	33	.01	µg/L	1
	1,2,4-Trichlorobenzene	12	50	.02	µg/L	2
26	Abietic Acid	11	73	.04	mg/L	3
	Dehydroabietic Acid	11	82	.42	mg/L	1
	Pimaric Acid	11	36	.01	mg/L	3
M8	BOD, 5 day, Total Demand	156	100	156.62	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.16
JAMES RIVER-MARATHON LTD.
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	347	100	770.84	mg/L	1
3	Hydrogen ion (pH)	347	100	3.77		
4a	Ammonia plus Ammonium	12	100	2.48	mg/L	1
	Total Kjeldahl Nitrogen	12	100	2.95	mg/L	1
6	Total phosphorus	11	100	.59	mg/L	1
7	Specific conductance	347	100	2,159.11	µS/cm	1
8	Total suspended solids	347	100	44.20	mg/L	1
9	Aluminum	52	100	271.15	µg/L	1
	Chromium	8	38	18.00	µg/L	1
	Copper	10	70	27.00	µg/L	1
	Nickel	12	42	30.00	µg/L	1
	Vanadium	11	36	30.91	µg/L	X
	Zinc	51	96	68.04	µg/L	1
12	Mercury	9	56	.49	µg/L	1
15	Sulphide	12	100	1.21	mg/L	1
16	Chloroform	12	100	772.02	µg/L	2
19	Camphene	12	33	2.39	µg/L	1
24	Total TCDD	12	58	.04	ng/L	1
	Total TCDF	12	100	.28	ng/L	1
	Total PCDD	12	42	.03	ng/L	1
	Total PCDF	12	75	.17	ng/L	1
	Total H6CDF	12	33	.05	ng/L	1
	Total H7CDD	12	58	.11	ng/L	2
	Octachlorodibenzo-p-dioxin	12	100	.42	ng/L	1
	Octachlorodibenzofuran	12	33	.05	ng/L	1
26	Abietic Acid	12	100	.11	mg/L	1
	Chlorodehydroabietic Acid	12	100	.20	mg/L	1
	Dehydroabietic Acid	155	99	.05	mg/L	1
	Dichlorodehydroabietic Acid	156	99	.04	mg/L	1
	Isopimaric Acid	12	100	.05	mg/L	1
	Levopimaric Acid	12	100	.05	mg/L	1
	Neoabietic Acid	12	100	.06	mg/L	1
	Oleic Acid	12	100	.11	mg/L	1
	Pimaric Acid	12	100	.03	mg/L	1
M8	BOD, 5 day, Total Demand	155	100	200.47	mg/L	1
M13	Adsorbable Organic Halide	157	100	44.97	mg/L	1

<u>Legend</u>
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.17
KIMBERLY-CLARK CANADA INC., HUNTSVILLE
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	169	100	79.72	mg/L	1
3	Hydrogen ion (pH)	170	100	7.23		
4a	Total Kjeldahl Nitrogen	6	100	6.17	mg/L	1
6	Total phosphorus	6	100	.22	mg/L	1
7	Specific conductance	170	100	492.68	µS/cm	1
9	Aluminum	23	61	49.13	µg/L	1
	Copper	6	67	13.33	µg/L	1
	Zinc	23	43	15.65	µg/L	1
16	Chloroform	6	100	3.57	µg/L	1
24	Octachlorodibenzo-p-dioxin	4	100	.20	ng/L	3
M8	BOD, 5 day, Total Demand	65	20	4.09	mg/L	1

<u>Legend</u>

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.18
KIMBERLY-CLARK CANADA INC., ST. CATHARINES
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	315	100	123.47	mg/L	1
3	Hydrogen ion (pH)	342	100	6.44		
4a	Total Kjeldahl Nitrogen	11	100	2.15	mg/L	1
6	Total phosphorus	11	64	.16	mg/L	1
7	Specific conductance	341	100	389.54	µS/cm	1
8	Total suspended solids	342	65	7.54	mg/L	1
9	Aluminum	50	100	117.83	µg/L	1
	Zinc	49	71	815.27	µg/L	1
16	1,1-Dichloroethane	12	50	.92	µg/L	1
	Methylene chloride	12	50	2.20	µg/L	X
	Tetrachloroethylene	12	42	1.60	µg/L	1
	Trichloroethylene	12	42	5.40	µg/L	1
17	Toluene	12	92	1.84	µg/L	1
19	2-Methylnaphthalene	12	75	3.69	µg/L	1
	Naphthalene	12	67	4.40	µg/L	1
20	Phenol	12	58	3.72	µg/L	1
24	Total TCDF	6	50	.02	ng/L	1
26	Abietic Acid	12	58	.03	mg/L	1
	Dehydroabietic Acid	11	73	.09	mg/L	1
	Isopimaric Acid	11	55	.02	mg/L	1
	Levopimaric Acid	12	33	.01	mg/L	1
	Oleic Acid	11	64	.07	mg/L	3
	Pimaric Acid	11	64	.02	mg/L	1
M8	BOD, 5 day, Total Demand	145	100	37.82	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.19
KIMBERLY-CLARK CANADA INC., TERRACE BAY
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	364	100	525.08	mg/L	1
3	Hydrogen ion (pH)	364	100	7.67		
4a	Ammonia plus Ammonium	53	89	.92	mg/L	1
	Total Kjeldahl Nitrogen	53	100	4.66	mg/L	1
4b	Nitrate+Nitrite	42	24	.38	mg/L	1
6	Total phosphorus	53	100	.49	mg/L	1
7	Specific conductance	364	100	1,895.80	µS/cm	1
8	Total suspended solids	364	100	42.51	mg/L	1
	Volatile suspended solids	52	100	39.09	mg/L	1
9	Aluminum	53	100	512.64	µg/L	1
	Chromium	12	92	148.33	µg/L	1
	Copper	12	33	10.83	µg/L	1
	Nickel	12	33	13.33	µg/L	1
	Zinc	53	98	89.62	µg/L	1
12	Mercury	12	33	.10	µg/L	X
15	Sulphide	12	50	.38	mg/L	1
16	Chloroform	12	100	11.97	µg/L	1
20	2,4,6-Trichlorophenol	12	75	4.84	µg/L	1
	2,4-Dichlorophenol	12	67	2.36	µg/L	1
24	2,3,7,8 TCDD	12	67	.03	ng/L	1
	Total TCDD	12	100	.32	ng/L	1
	Total TCDF	12	100	.32	ng/L	1
	Total PCDD	12	58	.04	ng/L	1
	Total PCDF	12	83	.04	ng/L	1
	Total H6CDD	12	58	.05	ng/L	1
	Total H7CDF	12	58	.04	ng/L	X
	Octachlorodibenzo-p-dioxin	12	100	.31	ng/L	1
	Octachlorodibenzofuran	12	58	.05	ng/L	1
26	Abietic Acid	12	50	.02	mg/L	1
	Chlorodehydroabietic Acid	12	33	.01	mg/L	1
	Dehydroabietic Acid	156	38	.01	mg/L	1
	Dichlorodehydroabietic Acid	156	17	.01	mg/L	1
	Oleic Acid	12	33	.01	mg/L	1
M8	BOD, 5 day, Total Demand	156	99	15.71	mg/L	1
M13	Adsorbable Organic Halide	157	100	21.23	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.20a
MACMILLAN-BLOEDEL LTD.
PROCESS EFFLUENT
(Control Point 1200)

ATG	PARAMETER	No.	F.D.(%)	LTA CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	341	100	5.27		
4a	Ammonia plus Ammonium	12	83	5.80	mg/L	3
	Total Kjeldahl Nitrogen	12	100	26.54	mg/L	3
4b	Nitrate+Nitrite	11	91	805.15	mg/L	3
5a	DOC	341	100	3,290.51	mg/L	3
6	Total phosphorus	12	100	2.06	mg/L	3
7	Specific conductance	340	100	2,812.13	µS/cm	3
8	Total suspended solids	341	100	98.05	mg/L	3
9	Aluminum	50	96	377.60	µg/L	3
	Cadmium	12	100	36.03	µg/L	3
	Chromium	12	33	30.17	µg/L	3
	Cobalt	12	92	44.50	µg/L	3
	Copper	12	75	42.50	µg/L	3
	Lead	12	92	72.58	µg/L	3
	Nickel	12	100	63.58	µg/L	3
	Thallium	12	42	50.00	µg/L	3
	Vanadium	12	75	68.75	µg/L	X
	Zinc	49	100	860.39	µg/L	3
26	Chlorodehydroabietic Acid	12	58	.15	mg/L	3
	Dehydroabietic Acid	123	79	.16	mg/L	3
	Isopimaric Acid	12	83	.61	mg/L	3
	Levopimaric Acid	12	58	.23	mg/L	3
	Neoabietic Acid	12	50	.08	mg/L	3
	Oleic Acid	12	58	.83	mg/L	3
	Pimaric Acid	12	75	.20	mg/L	3
M8	BOD, 5 day, Total Demand	150	100	3,312.88	mg/L	3

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.20b
MACMILLAN BLOEDEL LTD.
PROCESS EFFLUENT
(Control Point 1300)

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	343	100	6.07		
4a	Ammonia plus Ammonium	31	94	18.27	mg/L	3
	Total Kjeldahl Nitrogen	31	94	65.94	mg/L	3
4b	Nitrate+Nitrite	31	100	247.42	mg/L	3
5a	DOC	343	100	1,572.63	mg/L	3
6	Total phosphorus	31	100	8.07	mg/L	3
7	Specific conductance	343	100	1,680.40	µS/cm	3
8	Total suspended solids	343	100	359.09	mg/L	3
	Volatile suspended solids	25	100	389.04	mg/L	3
9	Aluminum	50	100	1,621.00	µg/L	3
	Cadmium	12	92	16.98	µg/L	3
	Chromium	12	42	30.75	µg/L	3
	Cobalt	12	75	36.67	µg/L	3
	Copper	12	75	61.58	µg/L	3
	Lead	12	58	50.83	µg/L	3
	Molybdenum	12	42	21.67	µg/L	3
	Nickel	12	75	66.08	µg/L	3
	Thallium	12	50	53.33	µg/L	3
	Vanadium	12	67	54.17	µg/L	X
	Zinc	48	100	572.29	µg/L	3
26	Abietic Acid	12	42	.03	mg/L	3
	Chlorodehydroabietic Acid	12	33	.03	mg/L	3
	Dehydroabietic Acid	126	83	.22	mg/L	3
	Isopimaric Acid	12	67	.61	mg/L	3
	Levopimaric Acid	12	75	1.43	mg/L	3
	Oleic Acid	12	67	.10	mg/L	3
	Pimaric Acid	12	75	.14	mg/L	3
M8	BOD, 5 day, Total Demand	149	100	1,482.52	mg/L	3

<u>Legend</u>
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.21
MALETTE KRAFT PULP AND POWER
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	342	100	605.71	mg/L	1
3	Hydrogen ion (pH)	342	100	5.17		
4a	Ammonia plus Ammonium	27	93	.74	mg/L	1
	Total Kjeldahl Nitrogen	27	100	2.01	mg/L	1
4b	Nitrate+Nitrite	27	30	.38	mg/L	1
6	Total phosphorus	27	100	.39	mg/L	1
7	Specific conductance	342	100	1,634.75	µS/cm	1
8	Total suspended solids	342	99	33.93	mg/L	1
9	Aluminum	43	100	3,553.49	µg/L	1
	Copper	8	50	10.00	µg/L	1
	Zinc	43	100	127.65	µg/L	1
15	Sulphide	12	100	1.77	mg/L	1
16	1,2-Dichloroethane	11	55	.79	µg/L	X
	Chloroform	11	91	154.37	µg/L	1
	Methylene chloride	11	45	4.91	µg/L	X
17	Benzene	11	36	3.84	µg/L	1
	Styrene	11	64	1.07	µg/L	3
	Toluene	11	73	2.41	µg/L	1
19	Camphene	12	50	9.50	µg/L	1
20	2,4,6-Trichlorophenol	12	58	4.55	µg/L	3
	2,4-Dichlorophenol	12	67	2.92	µg/L	3
	Phenol	12	83	23.37	µg/L	1
	m-Cresol	12	83	23.84	µg/L	1
	p-Cresol	12	33	2.82	µg/L	1
23	1,2,4-Trichlorobenzene	12	42	.01	µg/L	2
	2,4,5-Trichlorotoluene	12	58	.01	µg/L	3
24	Total TCDF	9	78	.16	ng/L	3
26	Abietic Acid	12	92	.80	mg/L	1
	Chlorodehydroabietic Acid	12	100	.10	mg/L	1
	Dehydroabietic Acid	145	99	.56	mg/L	1
	Dichlorodehydroabietic Acid	145	97	.12	mg/L	1
	Isopimaric Acid	12	100	.44	mg/L	1
	Levopimaric Acid	12	50	.32	mg/L	1
	Neoabietic Acid	12	75	.37	mg/L	1
	Pimaric Acid	12	92	.21	mg/L	1
M8	BOD, 5 day, Total Demand	145	100	155.94	mg/L	1
M13	Adsorbable Organic Halide	148	100	22.73	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.22
NORANDA FOREST INC., RECYCLED PAPERS
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	326	100	7.65		
4a	Total Kjeldahl Nitrogen	46	98	1.37	mg/L	1
4b	Nitrate+Nitrite	46	93	.53	mg/L	1
5a	DOC	322	100	77.51	mg/L	1
6	Total phosphorus	10	40	.10	mg/L	1
7	Specific conductance	325	100	923.84	µS/cm	1
8	Total suspended solids	324	100	71.50	mg/L	1
	Volatile suspended solids	46	100	34.12	mg/L	1
9	Aluminum	46	100	4,535.44	µg/L	1
	Copper	11	73	12.82	µg/L	1
	Zinc	46	100	97.52	µg/L	1
16	1,2-Dichloroethane	10	50	.67	µg/L	X
	Bromodichloromethane	10	100	5.95	µg/L	1
	Chloroform	10	100	101.34	µg/L	2
	Dibromochloromethane	10	50	1.29	µg/L	1
17	Benzene	10	50	2.21	µg/L	3
	m-Xylene and p-Xylene	10	50	1.84	µg/L	1
	o-Xylene	10	70	1.33	µg/L	1
23	Hexachlorocyclopentadiene	10	80	.17	µg/L	X
24	Octachlorodibenzo-p-dioxin	9	56	.09	ng/L	1
26	Dehydroabietic Acid	10	100	.32	mg/L	1
M8	BOD, 5 day, Total Demand	326	100	155.92	mg/L	1
M13	Adsorbable Organic Halide	10	100	5.25	mg/L	1

<u>Legend</u>
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.23
QUEBEC AND ONTARIO PAPER COMPANY LTD.
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
3	Hydrogen ion (pH)	231	100	7.31		
4a	Ammonia plus Ammonium	34	79	1.84	mg/L	1
	Total Kjeldahl Nitrogen	34	100	3.67	mg/L	1
4b	Nitrate+Nitrite	34	44	.31	mg/L	1
5a	DOC	226	100	29.34	mg/L	1
6	Total phosphorus	34	79	.43	mg/L	1
7	Specific conductance	229	100	694.88	µS/cm	1
8	Total suspended solids	231	100	50.05	mg/L	1
	Volatile suspended solids	34	100	37.62	mg/L	1
9	Aluminum	34	97	668.46	µg/L	1
	Copper	8	100	23.13	µg/L	1
	Zinc	33	100	167.73	µg/L	1
16	1,2-Dichloroethane	7	71	.73	µg/L	X
	Chloroform	7	57	1.44	µg/L	1
	Methylene chloride	7	43	2.84	µg/L	X
17	Toluene	7	43	6.57	µg/L	1
26	Dehydroabietic Acid	97	36	.08	mg/L	1
M8	BOD, 5 day, Total Demand	99	100	22.19	mg/L	1

<u>Legend</u>
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.24
ST. MARYS PAPER INC.
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	357	100	610.74	mg/L	1
3	Hydrogen ion (pH)	362	100	6.84		
4a	Total Kjeldahl Nitrogen	12	100	1.18	mg/L	1
6	Total phosphorus	12	100	.89	mg/L	1
7	Specific conductance	358	100	284.28	µS/cm	1
8	Total suspended solids	362	100	167.78	mg/L	1
9	Aluminum	51	100	2,396.47	µg/L	1
	Copper	10	60	10.60	µg/L	1
	Zinc	51	98	57.47	µg/L	1
16	1,2-Dichloroethane	12	33	.61	µg/L	X
	Chloroform	12	58	1.33	µg/L	1
	Chloromethane	11	27	3.84	µg/L	2
	Methylene chloride	12	67	24.49	µg/L	X
17	Benzene	12	58	1.34	µg/L	3
	Toluene	12	92	2.80	µg/L	3
20	Phenol	12	42	3.33	µg/L	1
	p-Cresol	12	67	6.13	µg/L	1
24	Octachlorodibenzo-p-dioxin	6	83	.16	ng/L	1
26	Abietic Acid	13	100	.71	mg/L	1
	Dehydroabietic Acid	149	100	2.14	mg/L	1
	Isopimaric Acid	13	92	.60	mg/L	1
	Levopimaric Acid	13	92	.31	mg/L	1
	Neoabietic Acid	13	92	.30	mg/L	1
	Oleic Acid	13	54	.06	mg/L	1
	Pimaric Acid	13	100	.20	mg/L	1
M8	BOD, 5 day, Total Demand	150	100	197.54	mg/L	1

<u>Legend</u>
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.25
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	356	100	852.08	mg/L	1
3	Hydrogen ion (pH)	356	100	5.98		
4a	Total Kjeldahl Nitrogen	12	92	2.58	mg/L	1
6	Total phosphorus	12	100	.28	mg/L	1
7	Conductivity, average	359	100	283.69	µS/cm	1
8	Total suspended solids	356	100	86.94	mg/L	1
9	Aluminum	53	100	251.32	µg/L	1
	Copper	12	100	23.33	µg/L	1
	Zinc	53	100	116.98	µg/L	2
16	Chloroform	9	100	3.99	µg/L	1
17	Toluene	8	100	3.39	µg/L	1
20	Phenol	12	33	2.00	µg/L	1
24	Octachlorodibenzo-p-dioxin	6	100	.38	ng/L	1
26	Abietic Acid	12	100	1.38	mg/L	1
	Chlorodehydroabietic Acid	12	58	.02	mg/L	2
	Dehydroabietic Acid	158	100	2.13	mg/L	1
	Isopimaric Acid	12	100	.47	mg/L	1
	Neoabietic Acid	12	100	1.61	mg/L	1
	Oleic Acid	12	100	.31	mg/L	1
	Pimaric Acid	12	92	.09	mg/L	1
M8	BOD, 5 day, Total Demand	158	100	424.67	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.26
STRATHCONA PAPER COMPANY
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	355	100	434.51	mg/L	1
3	Hydrogen ion (pH)	355	100	7.42		
4a	Ammonia plus Ammonium	52	85	2.41	mg/L	1
	Total Kjeldahl Nitrogen	52	100	11.48	mg/L	1
6	Total phosphorus	52	100	.51	mg/L	1
7	Specific conductance	355	100	709.09	µS/cm	1
8	Total suspended solids	355	100	64.52	mg/L	1
	Volatile suspended solids	52	98	62.58	mg/L	1
9	Aluminum	52	98	816.15	µg/L	1
	Zinc	50	74	20.36	µg/L	3
16	1,2-Dichloroethane	12	42	.64	µg/L	X
	Chloroform	12	58	2.39	µg/L	3
	Methylene chloride	12	50	42.75	µg/L	X
17	Toluene	12	42	1.37	µg/L	1
20	Phenol	12	50	7.69	µg/L	3
	m-Cresol	12	42	3.21	µg/L	1
	p-Cresol	12	50	16.34	µg/L	3
26	Dehydroabietic Acid	12	92	.24	mg/L	1
	Oleic Acid	12	42	.04	mg/L	3
	Pimaric Acid	12	33	.03	mg/L	1
M8	BOD, 5 day, Total Demand	150	100	106.58	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

TABLE 2.27
TRENT VALLEY DIVISION (PAPERBOARD INDUSTRIES CORP.)
PROCESS EFFLUENT

ATG	PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	QA/QC
1	COD	355	100	924.95	mg/L	1
3	Hydrogen ion (pH)	357	100	6.41		
4a	Total Kjeldahl Nitrogen	12	100	3.57	mg/L	1
6	Total phosphorus	12	100	.33	mg/L	1
7	Specific conductance	335	100	832.93	µS/cm	1
8	Total suspended solids	358	100	138.30	mg/L	1
9	Aluminum	51	100	6,104.31	µg/L	1
	Chromium	12	33	14.42	µg/L	1
	Copper	12	67	14.08	µg/L	1
	Zinc	50	100	150.34	µg/L	1
16	1,1-Dichloroethane	11	36	.71	µg/L	1
	1,1-Dichloroethylene	11	91	12.85	µg/L	3
	1,2-Dichloroethane	12	50	.67	µg/L	X
	Chloroform	13	31	1.10	µg/L	1
	Methylene chloride	12	25	2.37	µg/L	X
17	Benzene	13	31	.93	µg/L	1
	Toluene	13	77	2.30	µg/L	1
19	Naphthalene	12	33	1.05	µg/L	1
20	Pentachlorophenol	11	36	.93	µg/L	1
	Phenol	11	82	59.24	µg/L	2
	m-Cresol	11	73	13.19	µg/L	1
26	Abietic Acid	12	58	.05	mg/L	1
	Chlorodehydroabietic Acid	12	33	.01	mg/L	2
	Dehydroabietic Acid	12	100	.65	mg/L	1
	Isopimaric Acid	12	100	.04	mg/L	1
	Oleic Acid	12	42	.05	mg/L	1
	Pimaric Acid	12	42	.01	mg/L	3
M8	BOD, 5 day, Total Demand	153	100	415.22	mg/L	1

Legend
No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)
QA/QC = Quality assurance/quality control data assessment
1 = Data are of reliable quality
2 = Data are of limited quality
3 = Data are of unreliable quality
X = Parameter removed from candidate parameter list after QA/QC

(Notes)

TABLE 3.1
1990 AVERAGE PROCESS EFFLUENT FLOW (m^3/day)

COMPANY NAME	AVERAGE FLOW
ABITIBI-PRICE INC., Fort William Division - 0100	22,978
- 0200	4,100
ABITIBI-PRICE INC., Iroquois Falls Division	64,946
ABITIBI-PRICE INC., Provincial Papers Division	47,679
ABITIBI-PRICE INC., Thunder Bay Division	46,739
BEAVER WOOD FIBRE COMPANY	15,114
BOISE CASCADE CANADA LTD., Fort Frances	80,710
BOISE CASCADE CANADA LTD., Kenora	51,255
CANADIAN PACIFIC FOREST PRODUCTS LTD., Dryden	89,192
CANADIAN PACIFIC FOREST PRODUCTS LTD., Thunder Bay	176,069
DOMTAR INC., Containerboard Division (Red Rock)	97,050
DOMTAR INC., Containerboard Division (Trenton)	4,028
DOMTAR INC., Fine Papers Division (Cornwall)	129,073
DOMTAR INC., Fine Papers Division (St. Catharines)	10,186
E.B. EDDY FOREST PRODUCTS LTD., Espanola	101,641
E.B. EDDY FOREST PRODUCTS LTD., Ottawa	7,401
JAMES RIVER-MARATHON LTD.	60,430
KIMBERLY-CLARK CANADA INC., Huntsville	793
KIMBERLY-CLARK CANADA INC., St. Catharines	8,755
KIMBERLY-CLARK CANADA INC., Terrace Bay	91,695
MACMILLAN BLOEDEL LTD. - 1200	7,024
- 1300	5,819
MALETTE KRAFT PULP AND POWER	51,374
NORANDA FOREST INC., Recycled Papers	22,128
QUEBEC AND ONTARIO PAPER COMPANY LTD.	61,546
ST. MARYS PAPER INC.	34,731
SPRUCE FALLS POWER AND PAPER COMPANY LTD.	83,944
STRATHCONA PAPER COMPANY	3,321
Trent Valley Division (PAPERBOARD INDUSTRIES CORP.)	3,744
Total Flow for the Sector	1,383,465

(Notes)

TABLE 4.1
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
COOLING WATER EFFLUENT
(Control Point 0800)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
DOC	11	100	77.45	mg/L	231.85
Hydrogen ion (pH)	11	100	8.10		
Specific conductance	11	100	358.64	µS/cm	
Total suspended solids	11	91	19.00	mg/L	77.21
Average Flow	330	100	4,531.56	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.2
BEAVER WOOD FIBRE COMPANY
COOLING WATER EFFLUENT
(Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
DOC	11	100	13.39	mg/L	.20
Hydrogen ion (pH)	11	100	6.79		
Specific conductance	11	100	1,049.67	µS/cm	
Total suspended solids	11	100	18.44	mg/L	.31
Average Flow	219	100	12.47	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.3
BOISE CASCADE CANADA LTD., FORT FRANCES
COOLING WATER EFFLUENT
(Control Point 0600)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	12	83	22.80	mg/L	56.02
Hydrogen ion (pH)	12	100	6.95		
Specific conductance	12	100	41.21	µS/cm	
Total suspended solids	12	100	15.80	mg/L	35.89
Average Flow	364	100	2,285.65	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.4
BOISE CASCADE CANADA LTD., FORT FRANCES
COOLING WATER EFFLUENT
(Control Point 0700)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	12	83	22.58	mg/L	19.19
Hydrogen ion (pH)	12	100	7.00		
Specific conductance	12	100	43.17	µS/cm	
Total suspended solids	12	100	14.33	mg/L	12.18
Average Flow	364	100	850.00	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.5
CANADIAN PACIFIC FOREST PRODUCTS LTD., DRYDEN
COOLING WATER EFFLUENT
(Control Point 0800)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	6	100	24.17	mg/L	76.32
Hydrogen ion (pH)	6	100	7.40		
Specific conductance	6	100	65.17	µS/cm	
Average Flow	94	100	2,093.81	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.6
CANADIAN PACIFIC FOREST PRODUCTS LTD., DRYDEN
COOLING WATER EFFLUENT
(Control Point 0900)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	6	100	75.83	mg/L	203.07
Hydrogen ion (pH)	6	100	7.48		
Specific conductance	6	100	227.67	µS/cm	
Total suspended solids	6	83	18.33	mg/L	42.20
Average Flow	94	100	2,122.84	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.7
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY
COOLING WATER EFFLUENT
(Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	10	100	45.90	mg/L	1,914.27
Hydrogen ion (pH)	10	100	7.09		
Specific conductance	10	100	1,871.70	µS/cm	
Total suspended solids	10	70	8.43	mg/L	372.06
Average Flow	280	100	39,914.56	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.8
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
COOLING WATER EFFLUENT
(Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
DOC	8	100	8.39	mg/L	61.74
Hydrogen ion (pH)	7	100	6.46		
Specific conductance	7	100	80.40	µS/cm	
Total suspended solids	3	33	1.75	mg/L	22.30
Average Flow	230	100	3,839.58	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.9
JAMES RIVER-MARATHON LTD.
COOLING WATER EFFLUENT
(Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	12	50	10.08	mg/L	169.35
Hydrogen ion (pH)	12	100	7.56		
Specific conductance	12	100	129.17	µS/cm	
Total suspended solids	12	8	2.43	mg/L	42.63
Average Flow	355	100	18,855.06	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.10
JAMES RIVER-MARATHON LTD.
COOLING WATER EFFLUENT
(Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	11	45	10.36	mg/L	6.93
Hydrogen ion (pH)	11	100	7.29		
Specific conductance	11	100	117.64	µS/cm	
Average Flow	324	100	890.19	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.11
KIMBERLY-CLARK CANADA INC., TERRACE BAY
COOLING WATER EFFLUENT
(Control Point 0800)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	12	17	22.21	mg/L	36.31
Hydrogen ion (pH)	12	100	7.45		
Specific conductance	12	92	101.33	µS/cm	
Average Flow	363	100	1,635.00	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.12
MALETTE KRAFT PULP AND POWER
COOLING WATER EFFLUENT
(Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	6	100	40.00	mg/L	1,385.11
Hydrogen ion (pH)	6	100	7.40		
Specific conductance	6	100	118.67	µS/cm	
Total suspended solids	5	80	9.68	mg/L	352.71
Average Flow	163	100	36,053.07	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.13
STRATHCONA PAPER COMPANY
COOLING WATER EFFLUENT
(Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	12	100	41.42	mg/L	86.25
Hydrogen ion (pH)	12	100	7.99		
Specific conductance	12	100	322.33	µS/cm	
Total suspended solids	12	67	7.04	mg/L	14.58
Average Flow	337	100	2,151.50	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 4.14
STRATHCONA PAPER COMPANY
COOLING WATER EFFLUENT
(Control Point 0600)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS	LONG-TERM AVERAGE LOADING (kg/day)
COD	12	100	49.67	mg/L	15.09
Hydrogen ion (pH)	12	100	9.26		
Specific conductance	12	100	380.83	µS/cm	
Total suspended solids	12	42	6.01	mg/L	1.84
Average Flow	337	100	309.02	m3/day	

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.1
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
DOC	16	100	540.54	mg/L
Hydrogen ion (pH)	14	100	5.87	
Specific conductance	14	100	950.89	µS/cm
Total suspended solids	14	100	271.86	mg/L
Average Volume Discharged	12	100	725.72	m3/dicharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.2
DOMTAR INC., CONTAINERBOARD DIVISION (TRENTON)
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	4	100	5,245.50	mg/L
Hydrogen ion (pH)	4	100	7.62	
Specific conductance	4	100	1,717.25	µS/cm
Total suspended solids	4	100	1,125.00	mg/L
Average Volume Discharged	4	100	53.25	m3/discharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.3
DOMTAR INC., FINE PAPERS DIVISION (ST. CATHARINES)
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	1	100	23.00	mg/L
Hydrogen ion (pH)	1	100	7.00	
Specific conductance	1	100	425.00	µS/cm
Total suspended solids	1	100	30.00	mg/L
Average Volume Discharged	1	100	418.08	m3/discharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.4
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
DOC	16	100	32.11	mg/L
Hydrogen ion (pH)	16	100	6.22	
Specific conductance	16	100	251.31	µS/cm
Total suspended solids	15	100	48.37	mg/L
Average Flow	30	100	5,656.99	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.5
KIMBERLY-CLARK CANADA INC., ST. CATHARINES
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	4	100	663.75	mg/L
Hydrogen ion (pH)	4	100	6.97	
Specific conductance	4	100	351.00	µS/cm
Total suspended solids	4	100	433.50	mg/L
Average Volume Discharged	4	100	304.10	m3/discharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.6
KIMBERLY-CLARK CANADA INC., TERRACE BAY
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	1	100	465.70	mg/L
Hydrogen ion (pH)	3	100	10.53	
Specific conductance	3	100	2,870.00	µS/cm
Total suspended solids	3	100	158.00	mg/L
Average Volume Discharged	3	100	401.97	m3/discharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.7
NORANDA FOREST INC., RECYCLED PAPERS
EMERGENCY OVERFLOW EFFLUENT
(Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
DOC	15	100	105.33	mg/L
Hydrogen ion (pH)	11	100	7.97	
Specific conductance	15	100	710.00	µS/cm
Total suspended solids	11	100	1,357.53	mg/L
Average Volume Discharged	1	100	263.00	m3/discharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.8
NORANDA FOREST INC., RECYCLED PAPERS
EMERGENCY OVERFLOW EFFLUENT
(Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
DOC	3	100	87.00	mg/L
Hydrogen ion (pH)	1	100	7.73	
Specific conductance	3	100	893.33	µS/cm
Total suspended solids	1	100	317.00	mg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 5.9
ST. MARYS PAPER INC.
EMERGENCY OVERFLOW EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	178	100	3,006.24	mg/L
Hydrogen ion (pH)	180	100	7.03	
Specific conductance	180	100	306.15	µS/cm
Total suspended solids	179	100	1,886.70	mg/L
Average Volume Discharged	182	100	277.11	m3/discharge

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

(Notes)

TABLE 6.1
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
BACKWASH EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	10	90	12,536.94	µg/L
DOC	11	100	5.81	mg/L
Hydrogen ion (pH)	11	100	6.75	
Total suspended solids	11	100	148.18	mg/L
Average Volume Discharged	11	100	69.19	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 6.2
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
BACKWASH EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
DOC	12	100	7.30	mg/L
Hydrogen ion (pH)	12	100	6.20	
Total suspended solids	12	75	15.78	mg/L
Average Volume Discharged	12	100	371.01	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 6.3
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
BACKWASH EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	10	100	46.50	mg/L
Hydrogen ion (pH)	12	100	7.12	
Total suspended solids	12	17	6.33	mg/L
Average Volume Discharged	12	100	17,584.67	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

(Notes)

TABLE 7.1
ABITIBI-PRICE INC., THUNDER BAY DIVISION
WASTE DISPOSAL SITE EFFLUENT

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	9	100	.78	mg/L
Ammonia plus Ammonium	9	11	.18	mg/L
BOD, 5 day, Total Demand	9	100	353.78	mg/L
Chlorodehydroabietic Acid	9	33	.00	mg/L
Dehydroabietic Acid	9	100	1.55	mg/L
Hydrogen ion (pH)	9	100	6.78	
Isopimaric Acid	9	89	.55	mg/L
Levopimaric Acid	9	100	15.91	mg/L
Neoabietic Acid	9	78	.12	mg/L
Oleic Acid	9	22	.01	mg/L
Phenol	9	100	15.48	µg/L
Pimaric Acid	9	89	.12	mg/L
Total Kjeldahl Nitrogen	9	89	1.83	mg/L
Total phosphorus	9	100	.52	mg/L
Total suspended solids	9	100	26.87	mg/L
m-Cresol	9	100	19.01	µg/L
p-Cresol	9	89	37.32	µg/L
Average Flow	182	100	354.17	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

(Notes)

TABLE 8.1
ABITIBI-PRICE INC., FORT WILLIAM DIVISION
STORM WATER EFFLUENT
(Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
BOD, 5 day, Total Demand	1	100	21.00	mg/L
Dehydroabietic Acid	1	100	.03	mg/L
Hydrogen ion (pH)	1	100	7.11	
Total suspended solids	1	100	29.00	mg/L
Average Volume Discharge	1	100	578.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.2
ABITIBI-PRICE INC., FORT WILLIAM DIVISION
STORM WATER EFFLUENT
(Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
BOD, 5 day, Total Demand	1	100	18.30	mg/L
Chlorodehydroabietic Acid	1	100	.01	mg/L
Dehydroabietic Acid	1	100	.14	mg/L
Hydrogen ion (pH)	1	100	7.23	
Isopimaric Acid	1	100	.04	mg/L
Oleic Acid	1	100	.02	mg/L
Pimaric Acid	1	100	.03	mg/L
Total suspended solids	1	100	13.00	mg/L
Average Volume Discharged	1	100	537.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.3
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
STORM WATER EFFLUENT
(Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	50	.09	mg/L
BOD, 5 day, Total Demand	2	100	96.50	mg/L
Chlorodehydroabietic Acid	2	50	.04	mg/L
DOC	2	100	102.00	mg/L
Dehydroabietic Acid	2	100	1.78	mg/L
Hydrogen ion (pH)	2	100	7.31	
Isopimaric Acid	2	100	.08	mg/L
Neoabietic Acid	2	50	.01	mg/L
Oleic Acid	2	50	.02	mg/L
Phenol	2	50	3.55	µg/L
Pimaric Acid	2	100	.04	mg/L
Specific conductance	2	100	480.50	µS/cm
Total suspended solids	2	100	80.00	mg/L
m-Cresol	2	50	8.52	µg/L
p-Cresol	2	50	7.93	µg/L
Average Volume Discharged	2	100	48.18	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.4
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
STORM WATER EFFLUENT
(Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	50	.01	mg/L
BOD, 5 day, Total Demand	2	100	207.50	mg/L
DOC	2	100	220.00	mg/L
Dehydroabietic Acid	2	100	2.10	mg/L
Hydrogen ion (pH)	2	100	7.67	
Isopimaric Acid	2	50	.05	mg/L
Levopimaric Acid	2	50	.01	mg/L
Oleic Acid	2	50	.02	mg/L
Phenol	2	50	2.65	µg/L
Pimaric Acid	2	50	.03	mg/L
Specific conductance	2	100	808.00	µS/cm
Total suspended solids	2	100	880.00	mg/L
Average Volume Discharged	2	100	216.15	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.5
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
STORM WATER EFFLUENT
(Control Point 1000)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	2	100	915.00	µg/L
BOD, 5 day, Total Demand	2	100	14.15	mg/L
Chlorodehydroabietic Acid	2	50	.01	mg/L
DOC	2	100	20.70	mg/L
Dehydroabietic Acid	2	50	.02	mg/L
Hydrogen ion (pH)	2	100	7.50	
Mercury	2	50	.11	µg/L
Nickel	2	50	33.65	µg/L
Oleic Acid	2	50	.52	mg/L
Specific conductance	2	100	875.50	µS/cm
Total Kjeldahl Nitrogen	2	50	.40	mg/L
Total suspended solids	2	100	41.00	mg/L
Zinc	2	100	49.00	µg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.6
ABITIBI-PRICE INC., PROVINCIAL PAPERS DIVISION
STORM WATER EFFLUENT
(Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	50	.01	mg/L
BOD, 5 day, Total Demand	1	100	5.00	mg/L
DOC	2	100	36.50	mg/L
Dehydroabietic Acid	2	100	.26	mg/L
Hydrogen ion (pH)	2	100	6.99	
Isopimaric Acid	2	50	.01	mg/L
Levopimaric Acid	2	50	.04	mg/L
Specific conductance	2	100	653.00	µS/cm
Total suspended solids	2	100	953.00	mg/L
Average Volume Discharged	2	100	2,894.52	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.7
ABITIBI-PRICE INC., PROVINCIAL PAPERS DIVISION
STORM WATER EFFLUENT
(Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	50	.01	mg/L
BOD, 5 day, Total Demand	2	100	17.50	mg/L
Dehydroabietic Acid	2	50	.11	mg/L
Hydrogen ion (pH)	2	100	6.98	
Isopimaric Acid	2	100	.02	mg/L
Levopimaric Acid	2	50	.04	mg/L
Oleic Acid	2	50	.01	mg/L
Total suspended solids	2	100	111.50	mg/L
Average Volume Discharged	2	100	2,775.30	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.8
ABITIBI-PRICE INC., THUNDER BAY DIVISION
STORM WATER EFFLUENT
(Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Hydrogen ion (pH)	2	100	7.60	
Oleic Acid	2	50	.03	mg/L
Total suspended solids	2	50	5.70	mg/L
Average Volume Discharged	2	100	370.80	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.9
ABITIBI-PRICE INC., THUNDER BAY DIVISION
STORM WATER EFFLUENT
(Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	50	.03	mg/L
BOD, 5 day, Total Demand	2	100	75.50	mg/L
DOC	2	100	72.50	mg/L
Dehydroabietic Acid	2	100	.30	mg/L
Hydrogen ion (pH)	2	100	7.15	
Isopimaric Acid	2	50	.03	mg/L
Levopimaric Acid	2	50	.01	mg/L
Oleic Acid	2	50	.06	mg/L
Pimaric Acid	2	100	.03	mg/L
Total suspended solids	2	100	69.05	mg/L
Average Volume Discharged	2	100	74.75	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.10
BOISE CASCADE CANADA LTD., FORT FRANCES
STORM WATER EFFLUENT
(Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.02	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.05	mg/L
Hydrogen ion (pH)	2	100	7.05	
Isopimaric Acid	2	100	.02	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.01	mg/L
Pimaric Acid	2	100	.01	mg/L
Total suspended solids	2	100	10.00	mg/L
Average Volume Discharged	2	100	210.24	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.11
BOISE CASCADE CANADA LTD., FORT FRANCES
STORM WATER EFFLUENT
(Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.06	mg/L
BOD, 5 day, Total Demand	2	100	14.95	mg/L
COD	2	50	22.00	mg/L
Chlorodehydroabietic Acid	2	100	.06	mg/L
Dehydroabietic Acid	2	100	.40	mg/L
Hydrogen ion (pH)	2	100	7.20	
Isopimaric Acid	2	100	.08	mg/L
Levopimaric Acid	2	100	.02	mg/L
Neoabietic Acid	2	100	.02	mg/L
Oleic Acid	2	100	.01	mg/L
Pimaric Acid	2	100	.02	mg/L
Specific conductance	2	100	36.00	μS/cm
Total suspended solids	2	100	10.00	mg/L
Average Volume Discharged	2	100	534.15	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.12
CANADIAN PACIFIC FOREST PRODUCTS LTD., DRYDEN
STORM WATER EFFLUENT
(Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
Aluminum	2	100	420.00	μg/L
BOD, 5 day, Total Demand	2	100	40.15	mg/L
COD	2	100	660.00	mg/L
Cadmium	2	50	2.30	μg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.06	mg/L
Hydrogen ion (pH)	2	100	7.56	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Molybdenum	2	100	22.25	μg/L
Neoabietic Acid	2	100	.01	mg/L
Nickel	2	50	21.90	μg/L
Oleic Acid	2	100	.01	mg/L
Phenol	2	100	20.10	μg/L
Pimaric Acid	2	100	.01	mg/L
Specific conductance	2	100	960.00	μS/cm
Thallium	2	100	30.00	μg/L
Total suspended solids	2	100	42.40	mg/L
Zinc	2	100	164.10	μg/L
o-Cresol	2	50	8.44	μg/L
Average Volume Discharged	2	100	17,200.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.13
CANADIAN PACIFIC FOREST PRODUCTS LTD., DRYDEN
STORM WATER EFFLUENT
(Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	2	100	1,135.00	µg/L
Ammonia plus Ammonium	2	50	.28	mg/L
Benzo(g,h,i)perylene	2	100	1.70	µg/L
Benzo(k)fluoranthene	2	100	.80	µg/L
COD	2	50	19.50	mg/L
Copper	2	100	34.50	µg/L
Dibenz(a,h)anthracene	2	100	1.40	µg/L
Hydrogen ion (pH)	2	100	7.55	
Specific conductance	2	100	50.00	µS/cm
Total Kjeldahl Nitrogen	2	100	2.03	mg/L
Average Volume Discharged	2	100	3,050.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.14
CANADIAN PACIFIC FOREST PRODUCTS LTD., DRYDEN
STORM WATER EFFLUENT
(Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
BOD, 5 day, Total Demand	2	50	6.25	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.01	mg/L
Hydrogen ion (pH)	2	100	7.38	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.01	mg/L
Pimaric Acid	2	100	.01	mg/L
Total suspended solids	2	100	35.60	mg/L
Average Volume Discharged	2	100	2,550.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.15
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY
STORM WATER EFFLUENT
(Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
BOD, 5 day, Total Demand	2	100	13.10	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.01	mg/L
Hydrogen ion (pH)	2	100	7.08	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.03	mg/L
Pimaric Acid	2	100	.01	mg/L
Total suspended solids	2	100	123.60	mg/L
Average Volume Discharged	2	100	366.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.16
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY
STORM WATER EFFLUENT
(Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	2.15	mg/L
BOD, 5 day, Total Demand	2	100	485.00	mg/L
Chlorodehydroabietic Acid	2	100	.23	mg/L
Dehydroabietic Acid	2	100	3.50	mg/L
Hydrogen ion (pH)	2	100	5.78	
Isopimaric Acid	2	100	1.75	mg/L
Levopimaric Acid	2	100	1.05	mg/L
Neoabietic Acid	2	100	.84	mg/L
Oleic Acid	2	100	1.80	mg/L
Phenol	2	50	182.13	µg/L
Pimaric Acid	2	100	.90	mg/L
Total suspended solids	2	100	1,163.00	mg/L
o-Cresol	2	50	8.24	µg/L
Average Volume Discharged	2	100	366.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.17
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY
STORM WATER EFFLUENT
(Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
4-Nitrophenol	3	33	1.53	µg/L
Abietic Acid	3	100	.05	mg/L
BOD, 5 day, Total Demand	3	100	11.85	mg/L
Chlorodehydroabietic Acid	3	100	.03	mg/L
Dehydroabietic Acid	3	100	.11	mg/L
Hydrogen ion (pH)	3	100	6.62	
Isopimaric Acid	3	100	.04	mg/L
Levopimaric Acid	3	100	.01	mg/L
Neoabietic Acid	3	100	.02	mg/L
Oleic Acid	3	100	.06	mg/L
Pimaric Acid	3	100	.01	mg/L
Total suspended solids	3	100	208.67	mg/L
Average Volume Discharged	3	100	1,005.67	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.18
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY
STORM WATER EFFLUENT
(Control Point 0600)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
1-Methylnaphthalene	2	50	6.80	µg/L
2-Methylnaphthalene	2	50	10.95	µg/L
Aluminum	2	100	25,097.50	µg/L
Benzo(g,h,i)perylene	2	100	1.70	µg/L
Benzo(k)fluoranthene	2	100	.80	µg/L
COD	2	100	749.00	mg/L
Cadmium	2	50	13.30	µg/L
Chromium	2	50	76.50	µg/L
Cobalt	2	50	39.00	µg/L
Copper	2	100	108.50	µg/L
Dibenz(a,h)anthracene	2	100	1.40	µg/L
Fluoranthene	2	50	2.62	µg/L
Fluorene	2	50	4.57	µg/L
Hydrogen ion (pH)	2	100	7.47	
Lead	2	50	45.00	µg/L
Mercury	2	50	.07	µg/L
Molybdenum	2	100	32.25	µg/L
Naphthalene	2	50	1.55	µg/L
Nickel	2	50	63.90	µg/L
Phenanthrene	2	50	3.25	µg/L
Pyrene	2	50	3.10	µg/L
Specific conductance	2	50	707.42	µS/cm
Thallium	2	100	37.50	µg/L
Total Kjeldahl Nitrogen	2	50	7.64	mg/L
Total suspended solids	2	100	1,362.80	mg/L
Vanadium	2	50	74.90	µg/L
Zinc	2	100	137.40	µg/L
Average Volume Discharged	2	100	175.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.19
CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY
STORM WATER EFFLUENT
(Control Point 0700)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	3	100	.03	mg/L
Aluminum	3	100	1,335.00	µg/L
COD	3	100	373.00	mg/L
Chlorodehydroabietic Acid	3	100	.06	mg/L
Chromium	3	33	19.93	µg/L
Copper	3	67	10.67	µg/L
Dehydroabietic Acid	3	100	.70	mg/L
Hydrogen ion (pH)	3	100	7.54	
Isopimaric Acid	3	100	.07	mg/L
Levopimaric Acid	3	100	.01	mg/L
Molybdenum	3	67	24.50	µg/L
Neoabietic Acid	3	100	.01	mg/L
Nickel	3	67	37.33	µg/L
Oleic Acid	3	100	.01	mg/L
Phenol	3	33	1.21	µg/L
Pimaric Acid	3	100	.02	mg/L
Specific conductance	3	100	2,131.00	µS/cm
Thallium	3	33	21.67	µg/L
Total suspended solids	3	100	471.73	mg/L
Vanadium	3	33	29.00	µg/L
Zinc	3	100	15.40	µg/L
Average Volume Discharged	3	100	796.67	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.20
DOMTAR INC., CONTAINERBOARD DIVISION (RED ROCK)
STORM WATER EFFLUENT
(Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.03	mg/L
BOD, 5 day, Total Demand	2	100	37.00	mg/L
COD	2	100	131.50	mg/L
Chlorodehydroabietic Acid	2	100	.02	mg/L
Dehydroabietic Acid	2	100	.17	mg/L
Hydrogen ion (pH)	2	100	7.76	
Isopimaric Acid	2	100	.02	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.04	mg/L
Oleic Acid	2	100	.01	mg/L
Phenol	2	100	24.95	µg/L
Pimaric Acid	2	100	.01	mg/L
Specific conductance	2	100	828.00	µS/cm
Total suspended solids	2	100	30.50	mg/L
Average Volume Discharged	2	100	383.90	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.21
DOMTAR INC., CONTAINERBOARD DIVISION (TRENTON)
STORM WATER EFFLUENT
(Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	1	100	490.00	mg/L
Hydrogen ion (pH)	1	100	8.50	
Specific conductance	1	100	820.00	µS/cm
Total suspended solids	1	100	1,330.00	mg/L
Average Volume Discharged	1	100	498.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.22
DOMTAR INC., CONTAINERBOARD DIVISION (TRENTON)
STORM WATER EFFLUENT
(Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	1	100	.06	mg/L
Chlorodehydroabietic Acid	1	100	.01	mg/L
Dehydroabietic Acid	1	100	.19	mg/L
Hydrogen ion (pH)	1	100	9.00	
Isopimaric Acid	1	100	.08	mg/L
Neoabietic Acid	1	100	.13	mg/L
Oleic Acid	1	100	.05	mg/L
Phenol	1	100	16.20	µg/L
Pimaric Acid	1	100	.01	mg/L
Total suspended solids	1	100	2,740.00	mg/L
Average Volume Discharged	1	100	163.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.23
DOMTAR INC., CONTAINERBOARD DIVISION (TRENTON)
STORM WATER EFFLUENT
(Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
COD	2	100	1,434.00	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.02	mg/L
Hydrogen ion (pH)	2	100	7.95	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.01	mg/L
Phenol	2	100	460.60	µg/L
Pimaric Acid	2	100	.01	mg/L
Specific conductance	2	100	2,060.00	µS/cm
Total suspended solids	2	100	145.00	mg/L
o-Cresol	2	100	9.70	µg/L
Average Volume Discharged	2	100	113.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.24
DOMTAR INC., FINE PAPERS DIVISION (CORNWALL)
STORM WATER EFFLUENT
(Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
BOD, 5 day, Total Demand	1	100	305.00	mg/L
Chlorodehydroabietic Acid	2	100	.02	mg/L
Dehydroabietic Acid	2	100	.02	mg/L
Hydrogen ion (pH)	2	100	7.24	
Levopimaric Acid	1	100	.01	mg/L
Neoabietic Acid	1	100	.01	mg/L
Oleic Acid	2	100	.04	mg/L
Phenol	2	50	30.00	µg/L
Pimaric Acid	1	100	.01	mg/L
Total suspended solids	1	100	706.00	mg/L
o-Cresol	2	50	55.50	µg/L
Average Volume Discharged	1	100	406.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.25
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
STORM WATER EFFLUENT
(Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
2,4,6-Trichlorophenol	3	33	.85	µg/L
Abietic Acid	3	100	.48	mg/L
BOD, 5 day, Total Demand	3	100	15.67	mg/L
Chlorodehydroabietic Acid	3	67	.02	mg/L
DOC	3	100	42.47	mg/L
Dehydroabietic Acid	3	100	1.28	mg/L
Hydrogen ion (pH)	3	100	10.60	
Isopimaric Acid	3	100	.36	mg/L
Levopimaric Acid	3	100	.13	mg/L
Neoabietic Acid	3	33	.04	mg/L
Oleic Acid	3	67	.22	mg/L
Phenol	3	67	128.60	µg/L
Pimaric Acid	3	100	.17	mg/L
Specific conductance	3	100	860.00	µS/cm
Total suspended solids	3	100	143.33	mg/L
Average Volume Discharged	3	100	5.66	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.26
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
STORM WATER EFFLUENT
(Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
2,3,4,5-Tetrachlorophenol	3	33	313.36	µg/L
Abietic Acid	3	100	.49	mg/L
BOD, 5 day, Total Demand	3	100	608.33	mg/L
Chlorodehydroabietic Acid	3	100	.03	mg/L
Dehydroabietic Acid	3	100	1.50	mg/L
Hydrogen ion (pH)	3	100	6.33	
Isopimaric Acid	3	100	.63	mg/L
Levopimaric Acid	3	100	.20	mg/L
Neoabietic Acid	3	67	.03	mg/L
Oleic Acid	3	100	1.72	mg/L
Phenol	3	100	259.00	µg/L
Pimaric Acid	3	100	.16	mg/L
Total suspended solids	3	100	13,326.33	mg/L
m-Cresol	3	100	72.67	µg/L
o-Cresol	3	100	70.07	µg/L
p-Cresol	3	100	16.03	µg/L
Average Volume Discharged	3	100	15.93	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.27
JAMES RIVER-MARATHON LTD.
STORM WATER EFFLUENT
(Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	2	100	102.00	mg/L
Hydrogen ion (pH)	2	100	7.61	
Specific conductance	2	100	240.00	µS/cm
Total suspended solids	2	100	109.50	mg/L
Average Volume Discharged	2	100	71.75	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.28
JAMES RIVER-MARATHON LTD.
STORM WATER EFFLUENT
(Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Hydrogen ion (pH)	2	100	7.48	
Oleic Acid	2	100	.01	mg/L
Average Volume Discharged	2	100	1,410.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.29
JAMES RIVER-MARATHON LTD.
STORM WATER EFFLUENT
(Control Point 0600)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Hydrogen ion (pH)	2	100	7.42	
Oleic Acid	2	100	.01	mg/L
Total suspended solids	2	50	6.50	mg/L
Average Volume Discharged	2	100	530.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.30
JAMES RIVER-MARATHON LTD.
STORM WATER EFFLUENT
(Control Point 0700)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
BOD, 5 day, Total Demand	2	100	7.50	mg/L
Hydrogen ion (pH)	2	100	7.48	
Oleic Acid	2	100	.01	mg/L
Total suspended solids	2	100	175.50	mg/L
Average Volume Discharged	2	100	46.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.31
JAMES RIVER-MARATHON LTD.
STORM WATER EFFLUENT
(Control Point 0800)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	2	100	45.00	mg/L
Hydrogen ion (pH)	2	100	7.61	
Oleic Acid	2	100	.01	mg/L
Specific conductance	2	100	265.00	µS/cm
Total suspended solids	2	100	32.00	mg/L
Average Volume Discharged	2	100	16.85	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.32
KIMBERLY-CLARK CANADA INC., HUNTSVILLE
STORM WATER EFFLUENT
(Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	2	100	32.00	mg/L
Hydrogen ion (pH)	2	100	7.58	
Specific conductance	2	100	80.50	µS/cm
Total suspended solids	2	50	3.50	mg/L
Average Volume Discharged	2	100	170.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.33
KIMBERLY-CLARK CANADA INC., TERRACE BAY
STORM WATER EFFLUENT
(Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.32	mg/L
BOD, 5 day, Total Demand	2	100	226.50	mg/L
Chlorodehydroabietic Acid	2	100	.02	mg/L
Dehydroabietic Acid	2	100	1.03	mg/L
Hydrogen ion (pH)	2	100	6.45	
Isopimaric Acid	2	100	.06	mg/L
Neoabietic Acid	2	100	.08	mg/L
Oleic Acid	2	100	.01	mg/L
Phenol	2	50	6.45	µg/L
Pimaric Acid	2	100	.05	mg/L
Total suspended solids	2	100	76.20	mg/L
o-Cresol	2	50	8.35	µg/L
Average Volume Discharged	2	100	132.20	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.34
KIMBERLY-CLARK CANADA INC., TERRACE BAY
STORM WATER EFFLUENT
(Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	2	100	392.00	mg/L
Hydrogen ion (pH)	2	100	9.14	
Specific conductance	2	50	200.25	µS/cm
Total suspended solids	2	50	694.50	mg/L
Average Volume Discharged	2	100	280.60	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.35
KIMBERLY-CLARK CANADA INC., TERRACE BAY
STORM WATER EFFLUENT
(Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	1	100	.31	mg/L
BOD, 5 day, Total Demand	2	100	114.50	mg/L
Chlorodehydroabietic Acid	1	100	.01	mg/L
Dehydroabietic Acid	1	100	2.24	mg/L
Hydrogen ion (pH)	2	100	10.92	
Isopimaric Acid	1	100	.19	mg/L
Neoabietic Acid	1	100	.26	mg/L
Oleic Acid	1	100	.07	mg/L
Phenol	1	100	4.70	µg/L
Pimaric Acid	1	100	.01	mg/L
Total suspended solids	2	100	981.60	mg/L
Average Volume Discharged	2	100	130.80	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.36
MACMILLAN-BLOEDEL LTD.
STORM WATER EFFLUENT
(Control Point 1400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.10	mg/L
BOD, 5 day, Total Demand	2	100	69.00	mg/L
Chlorodehydroabietic Acid	1	100	.01	mg/L
Dehydroabietic Acid	2	100	.07	mg/L
Hydrogen ion (pH)	2	100	6.94	
Isopimaric Acid	1	100	.01	mg/L
Levopimaric Acid	2	100	.12	mg/L
Neoabietic Acid	1	100	.01	mg/L
Oleic Acid	2	100	.08	mg/L
Pimaric Acid	2	100	.05	mg/L
Total suspended solids	2	100	15.50	mg/L
Average Volume Discharged	2	100	1,275.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.37
MACMILLAN-BLOEDEL LTD.
STORM WATER EFFLUENT
(Control Point 2300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	1	100	.01	mg/L
BOD, 5 day, Total Demand	2	100	143.50	mg/L
Chlorodehydroabietic Acid	1	100	.01	mg/L
Dehydroabietic Acid	1	100	.01	mg/L
Hydrogen ion (pH)	2	100	6.33	
Isopimaric Acid	1	100	.01	mg/L
Levopimaric Acid	1	100	.01	mg/L
Neoabietic Acid	1	100	.01	mg/L
Oleic Acid	1	100	.01	mg/L
Pimaric Acid	1	100	.01	mg/L
Total suspended solids	2	100	158.00	mg/L
Average Volume Discharged	2	100	459.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.38
MALETTE KRAFT PULP AND POWER
STORM WATER EFFLUENT
(Control Point 0800)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	1	100	230.00	mg/L
Hydrogen ion (pH)	1	100	7.80	
Specific conductance	1	100	1,440.00	µS/cm
Total suspended solids	1	100	158.00	mg/L
Average Volume Discharged	1	100	3.20	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.39
MALETTE KRAFT PULP AND POWER
STORM WATER EFFLUENT
(Control Point 0900)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Chlorodehydroabietic Acid	1	100	.02	mg/L
Dehydroabietic Acid	1	100	.57	mg/L
Isopimaric Acid	1	100	.02	mg/L
Oleic Acid	1	100	1.42	mg/L
Phenol	1	100	22.00	µg/L
Pimaric Acid	1	100	.02	mg/L
m-Cresol	1	100	24.00	µg/L
p-Cresol	1	100	43.00	µg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.40
MALETTE KRAFT PULP AND POWER
STORM WATER EFFLUENT
(Control Point 1000)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
BOD, 5 day, Total Demand	2	100	52.50	mg/L
COD	2	100	126.00	mg/L
Chlorodehydroabietic Acid	1	100	.02	mg/L
Dehydroabietic Acid	2	100	43.79	mg/L
Hydrogen ion (pH)	2	100	7.55	
Isopimaric Acid	1	100	.02	mg/L
Oleic Acid	2	100	58.71	mg/L
Phenol	1	100	22.00	µg/L
Pimaric Acid	1	100	.02	mg/L
Specific conductance	2	100	1,510.00	µS/cm
Total suspended solids	2	100	257.50	mg/L
m-Cresol	2	50	12.50	µg/L
p-Cresol	1	100	4.30	µg/L
Average Volume Discharged	2	100	61.95	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.41
ST. MARYS PAPER INC.
STORM WATER EFFLUENT
(Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
BOD, 5 day, Total Demand	2	100	12.50	mg/L
Dehydroabietic Acid	2	50	.01	mg/L
Hydrogen ion (pH)	2	100	7.63	
Oleic Acid	2	50	.10	mg/L
Total suspended solids	2	100	92.00	mg/L
Average Volume Discharged	2	100	229.10	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.42
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
STORM WATER EFFLUENT
(Control Point 0200)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
COD	2	100	27.00	mg/L
Hydrogen ion (pH)	2	100	7.63	
Specific conductance	2	100	757.00	µS/cm
Total suspended solids	2	50	10.50	mg/L
Average Volume Discharged	2	100	664.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.43
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
STORM WATER EFFLUENT
(Control Point 0300)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	2	100	170.00	µg/L
COD	2	100	123.00	mg/L
Chromium	2	50	20.00	µg/L
Hydrogen ion (pH)	2	100	7.30	
Mercury	2	50	.17	µg/L
Specific conductance	2	100	840.50	µS/cm
Total Kjeldahl Nitrogen	2	50	.74	mg/L
Total suspended solids	2	100	17.00	mg/L
Zinc	2	50	10.00	µg/L
Average Volume Discharged	2	100	89.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.44
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
STORM WATER EFFLUENT
(Control Point 0400)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
BOD, 5 day, Total Demand	2	50	89.05	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.01	mg/L
Hydrogen ion (pH)	2	100	7.37	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.01	mg/L
Pimaric Acid	2	100	.01	mg/L
Total suspended solids	2	100	16.00	mg/L
Average Volume Discharged	2	100	1,375.00	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.45
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
STORM WATER EFFLUENT
(Control Point 0500)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
COD	2	100	63.50	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.01	mg/L
Hydrogen ion (pH)	2	100	7.62	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.01	mg/L
Pimaric Acid	2	100	.01	mg/L
Specific conductance	2	100	609.00	µS/cm
Total suspended solids	2	50	7.00	mg/L
Average Volume Discharged	2	100	1,243.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 8.46
SPRUCE FALLS POWER AND PAPER COMPANY LTD.
STORM WATER EFFLUENT
(Control Point 0600)

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Abietic Acid	2	100	.01	mg/L
BOD, 5 day, Total Demand	2	100	91.40	mg/L
Chlorodehydroabietic Acid	2	100	.01	mg/L
Dehydroabietic Acid	2	100	.01	mg/L
Hydrogen ion (pH)	2	100	7.63	
Isopimaric Acid	2	100	.01	mg/L
Levopimaric Acid	2	100	.01	mg/L
Neoabietic Acid	2	100	.01	mg/L
Oleic Acid	2	100	.01	mg/L
Pimaric Acid	2	100	.01	mg/L
Average Volume Discharged	2	100	211.50	m3

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

(Notes)

TABLE 9.1
ABITIBI-PRICE INC., FORT WILLIAM DIVISION
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
1,2-Dichloroethane	10	50	.66	µg/L
Abietic Acid	10	50	.02	mg/L
Aluminum	46	100	606.09	µg/L
BOD, 5 day, Total Demand	126	65	8.36	mg/L
Benzene	10	30	1.76	µg/L
Bromomethane	10	10	1.87	µg/L
Chlorodehydroabietic Acid	10	10	<.01	mg/L
Chloroform	10	80	17.37	µg/L
Chloromethane	10	10	9.98	µg/L
Chromium	10	30	14.90	µg/L
Copper	9	22	17.44	µg/L
DOC	302	100	18.40	mg/L
Dehydroabietic Acid	132	77	.05	mg/L
Hydrogen ion (pH)	301	100	7.05	
Isopimaric Acid	10	50	.04	mg/L
Mercury	10	10	.06	µg/L
Methylene chloride	10	60	10.73	µg/L
Neoabietic Acid	11	36	.26	mg/L
Nitrate+Nitrite	10	20	.14	mg/L
Octachlorodibenzo-p-dioxin	5	20	.03	ng/L
Oleic Acid	10	40	.05	mg/L
Pimaric Acid	10	20	<.01	mg/L
Specific conductance	301	100	159.42	µS/cm
Styrene	10	10	.29	µg/L
Toluene	10	30	.63	µg/L
Total Kjeldahl Nitrogen	10	50	.49	mg/L
Total suspended solids	299	69	9.67	mg/L
Zinc	46	74	14.65	µg/L
Average Flow	302	100	25,741.99	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.2
ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
1,2,4-Trichlorobenzene	11	9	<.01	µg/L
1,2-Dichloroethane	11	45	.65	µg/L
Abietic Acid	10	20	<.01	mg/L
Aluminum	48	98	3,004.08	µg/L
Benzene	11	18	.70	µg/L
Bromomethane	11	18	3.46	µg/L
Chloroform	11	36	2.50	µg/L
Chloromethane	11	27	13.38	µg/L
Chromium	11	9	8.45	µg/L
Copper	10	30	16.90	µg/L
DOC	11	100	16.51	mg/L
Dehydroabietic Acid	10	70	.14	mg/L
Hydrogen ion (pH)	334	100	7.46	
Isopimaric Acid	10	30	<.01	mg/L
Levopimaric Acid	10	30	.02	mg/L
Mercury	11	9	.07	µg/L
Methylene chloride	11	64	10.34	µg/L
Neoabietic Acid	10	10	<.01	mg/L
Nitrate+Nitrite	11	9	.20	mg/L
Oleic Acid	10	10	.02	mg/L
Phenol	11	9	.67	µg/L
Pimaric Acid	10	30	.06	mg/L
Specific conductance	285	100	113.66	µS/cm
Total Kjeldahl Nitrogen	11	36	.41	mg/L
Total phosphorus	11	9	.06	mg/L
Total suspended solids	334	99	20.08	mg/L
Vanadium	11	9	12.33	µg/L
Zinc	11	45	15.00	µg/L
p-Cresol	11	9	1.02	µg/L
Average Flow	334	100	66,483.48	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.3
ABITIBI-PRICE INC., PROVINCIAL PAPERS DIVISION
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
1,2-Dichloroethane	11	45	.65	µg/L
Abietic Acid	11	9	<.01	mg/L
Aluminum	11	82	253.64	µg/L
Benzene	11	18	.86	µg/L
Bromomethane	11	9	1.13	µg/L
Chloroform	11	27	1.35	µg/L
Copper	11	9	14.18	µg/L
Dehydroabietic Acid	11	55	.03	mg/L
Hydrogen ion (pH)	8	100	7.59	
Isopimaric Acid	11	9	<.01	mg/L
Methylene chloride	11	82	17.29	µg/L
Nitrate+Nitrite	11	100	.34	mg/L
Oleic Acid	11	18	.01	mg/L
Pimaric Acid	11	9	<.01	mg/L
Specific conductance	7	100	94.60	µS/cm
Toluene	11	27	.36	µg/L
Zinc	11	9	7.09	µg/L
m-Xylene and p-Xylene	11	9	.30	µg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.4
ABITIBI-PRICE INC., THUNDER BAY DIVISION
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
1,2,4-Trichlorobenzene	12	17	<.01	µg/L
1,2-Dichloroethane	11	45	.65	µg/L
Abietic Acid	11	9	<.01	mg/L
Aluminum	12	83	101.75	µg/L
Benzene	11	36	1.96	µg/L
Bromodichloromethane	11	9	.45	µg/L
Chlorodehydroabietic Acid	11	9	<.01	mg/L
Chloroform	11	73	2.70	µg/L
Chloromethane	11	9	5.23	µg/L
Copper	12	8	13.62	µg/L
Dehydroabietic Acid	11	55	.01	mg/L
Hexachlorocyclopentadiene	12	33	.01	µg/L
Hydrogen ion (pH)	10	100	6.87	
Mercury	12	8	.07	µg/L
Methylene chloride	11	55	7.25	µg/L
Nitrate+Nitrite	12	83	.30	mg/L
Oleic Acid	11	27	2.28	mg/L
Specific conductance	9	100	93.94	µS/cm
Styrene	11	9	.27	µg/L
Toluene	11	9	.33	µg/L
Zinc	12	17	14.42	µg/L
m-Xylene and p-Xylene	11	9	.30	µg/L
Average Flow	4	100	44,347.50	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.5
BEAVER WOOD FIBRE COMPANY
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
DOC	1	100	8.00	mg/L
Hydrogen ion (pH)	1	100	18.00	
Total suspended solids	195	74	9.85	mg/L
Average Flow	260	100	14,225.65	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.6
DOMTAR INC., FINE PAPERS DIVISION (CORNWALL)
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	1	100	40.00	µg/L
Chlorodehydroabietic Acid	1	100	.01	mg/L
Copper	1	100	2,510.00	µg/L
Dehydroabietic Acid	1	100	.01	mg/L
Dichlorodehydroabietic Ac.	1	100	.01	mg/L
Hydrogen ion (pH)	1	100	8.12	
Isopimaric Acid	1	100	.01	mg/L
Lead	1	100	170.00	µg/L
Levopimaric Acid	1	100	.01	mg/L
Neoabietic Acid	1	100	.01	mg/L
Oleic Acid	1	100	.01	mg/L
Pimaric Acid	1	100	.01	mg/L
Specific conductance	1	100	288.00	µS/cm
Zinc	1	100	1,510.00	µg/L
Average Flow	1	100	117,000.00	m3/day

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.7
E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	3	67	129.90	µg/L
Benzene	1	100	3.70	µg/L
Dehydroabietic Acid	1	100	.03	mg/L
Mercury	1	100	.11	µg/L
Nickel	3	100	49.67	µg/L
Sulphide	1	100	.03	mg/L
Zinc	3	33	5.33	µg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.8
NORANDA FOREST INC., RECYCLED PAPERS
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Total suspended solids	12	100	16.33	mg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)

TABLE 9.9
STRATHCONA PAPER COMPANY
INTAKE WATER

PARAMETER	No.	F.D.(%)	LONG-TERM AVERAGE CONCENTRATION	UNITS
Aluminum	1	100	70.00	µg/L
COD	1	100	21.00	mg/L
Dehydroabietic Acid	1	100	.03	mg/L
Hydrogen ion (pH)	1	100	8.18	
Specific conductance	1	100	273.00	µS/cm
Vanadium	1	100	49.00	µg/L

No. = Number of analyses
F.D. = Frequency of Detection Above Regulation Method Detection Limit (%)